Excavation and Rehabilitation Management Plan

EXTENSION AGRICULTURAL LIME QUARRY

Lot 502 MURRAY ROAD, QUALLILUP Shire of Esperance

Triple M Transport (WA) Pty Ltd

February 2017

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AGRICULTURAL LIME
QUARRY

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SUMMARY

Crushed Limestone is an essential resource to the State, for correcting soil acidity caused during normal farming operations through the use of nitrogenous fertilizer and legume crops. The need for crushed limestone is recognised by the Department of Agriculture and Food (Bulletin 4784) They have also recognised the importance of this operation in an area of few limestone resources in DAF Bulletin 4760.

The limestone will be used to prevent soil acidification, which is a well recognised major environmental issue, highlighted in the various State of Environment Reports on Western Australia, where it is estimated that 55% of the agricultural land in Western Australia is susceptible to the problem. Soil acidification also causes stock toxicity from some metals (eg aluminium) which move into solution in acidic or low pH conditions.

The only mechanism to counteract the increasing acidity is the application of calcium carbonate. The sources of calcium carbonate are limesand and Tamala Coastal Limestone.

The proposal seeks to provide a continued resource of strategically located limestone, suited to a variety of end products. The majority of the lime from this pit will be used in the agricultural industry.

This proposal seeks approval to progressively clear and excavate up to approximately 16 hectares of resource over a period of ten years.

The site lies in coastal vegetation at Dalyup west of Esperance. The only limestone in the area lies within the coastal dune network which almost everywhere is located within coastal reserves and Crown land.

The limestone on Lot 502 represents one of the few places where this material is available on private land. The site has operated as a limestone pit since 1999 through an Extractive Industries Licence and originally permission to clear through the *Soil and Land Conservation Act 1945*.

An Extractive Industry Licence is currently in place through the Shire of Esperance for the existing pit and this seeks to extend the excavation onto the next stages of the resource.

A vegetation Study has been completed by the Esperance Wildflower Society who did not record any Threatened or Priority species or any Threatened or significant Ecological Communities.

The size of the current pit is limited so there has not been the opportunity to undertake any significant rehabilitation. Rehabilitation will be undertaken progressively as the new ground is opened and the completed areas are excavated.

Considering the location of this remnant vegetation, its general lack of agricultural capability, combined with the majority of the calcareous sand substrate being too low in grade for use as agricultural lime, there is little development pressure on this coastal vegetation type which will be maintained as regional ecological linkages.

There are no dwellings within 1 km of the site and the proposed operation has been designed to minimise or eliminate any dust, noise or visual impact.

It is anticipated that the life of the pit will be over 20 years. Extraction is anticipated to commence at around 30 000 to 50 000 tonnes per year and perhaps 100 000 tonnes per year in a particularly busy year. At 50 000 tonnes that would equate to 10- 20 laden truck movements per day on average (six days per week).

Transport will continue to be along Murray Road.

The Excavation and Rehabilitation Management Plan addresses;

- Groundwater quality and quantity protection;
- Land surface stabilisation and interim rehabilitation, including erosion mitigation and topsoil management
- Waste management
- Dust management
- Dieback management
- Contours and final ground surface levels
- Fire management
- Site security

Environmental issues including dust, noise and traffic can be managed in such a way to minimise or eliminate any significant impact both on site and offsite. Dust and noise can be contained by the methods of extraction to be used and the control measures which will be put into place. Measures to protect the site and minimise the influence of dieback are addressed under Environmental Management.

Project Summary

ASPECT	PROPOSAL CHARACTERISTIC
EXCAVATION	
Area of proposed new excavation	Proposed Pit approximately 16.0 hectares progressively.
Limestone extraction	30 000 to 50 000 tonnes and perhaps 100 000 per year in a particularly busy year
Total estimated resource	Limestone – up to1 000 000 tonnes.
Life of project	10 - 20 years
Area cleared per year	Initially about 2.5 hectares to provide an operational area and then 0.5 hectares – per year depending on the elevation of the ridge.
Total area to be cleared	16.0 hectares in proposed pit progressively. A Clearing Permit will be required.
Area mined per year	0.5 hectares approx.
Dewatering requirements	None
Maximum depth of excavations	15 metres, but depends on the depth of the high grade limestone which may extend deeper
PROCESSING	
Limestone	Same as the amount extracted.
Water requirements	Only required for dust suppression in excessively dusty situations, on site transport and processing. The limestone will be moist when extracted and will not need dust suppression. Water for dust suppression has not been required in the past operations
Water supply source	Local farm water supply if required, from Lot 502.
INFRASTRUCTURE	
Total area of plant and stock	Mobile plant will be used, located within excavation footprint.
Area of settling ponds	Not required
Fuel storage	Not required, mobile tankers will be used
TRANSPORT	
Truck movements	Variable but approximately 10 laden trucks per day maximum depending on the volumes of limestone extracted. Based on a 40 tonne load and 50 000 tonnes per year.
Access	Continued access along Murray Road.
WORKFORCE	
Construction	2 - 3
Operation	2 - 3
Hours of operation	Monday - Saturday 6.30 am to 5.00 pm excluding public holidays. Generally in the months December to March annually.

An Environmental Risk Assessment has been completed.

CONTENTS

ATTACHMENTS

1.0 INTRODUCTION

1.1 Background and Proposal

Limestone has been mined from this site since 2000 at a rate of 30 000 – 50 000 tonnes per year with up to 100 000 tonnes in a particualry busy year.

Approvals have been in place since that time and are current until 2021.

As the resource is running out on the existing site excavation on the western side of the beach access road, a new resource on the eastern side of the road is required to enable a smooth transition of excavation, continued availability of resource and rehabilitation of the existing pit.

Until the new pit has sufficient area for all operations, both pits will need to operate.

The limestone on Lot 502 remains highly suitable for lime for agriculture and neutralisation of acidity in addition to some road bases. Drilling has been completed and testing of the lime neutralising value carried out.

Location

The site lies approximately 40 km west from Esperance at the end of Murray's Road on the eastern side of Lake Quallilup, 300 metres from the lake and 500 metres from the closest portion of coast.

The subject land is owed by the proponent.

Current Land Use

Lot 502 is covered by pasture and remnant coastal vegetation. The land is used predominantly for grazing but has had a number of other agricultural activities on site over the years such as plantation.

The area applied for on Lot 502 is covered by remnant coastal vegetation that was burnt in summer 2015 to 2016.

The proposed quarry site lies immediately east from the existing approved pit which is also used for agricultural lime.

Minor exploration work has been completed for the new proposal including the preparation of access tracks, drilling and sampling.

Existing Approvals

There are no current approvals for the extended area, but the existing pit has current palnning approval and an Extractive Industries Licence.

An Extractive Industry Licence was granted by the Shire of Esperance on 30 October 2000 and renewed in October 2001 for a period of 21 years. Shire of Esperance Resolution 0208-1260. A copy of that approval is included in Attachment 3.

During the application for the Extractive Industries Licence there was a significant amount of liaison with the various Government Departments.

The existing sand excavations were considered by the Department of Environmental Protection under delegated authority from the EPA under *Part V of the Environmental Protection Act 1986*. The decision was "Informal Review with Public Advice Given". DEP Reference 147010. Attachment 3.

The decision was appealed and dismissed by the Minister for the Environment on 12 June 2000. Attachment 3.

The original parts of the site were cleared, and some vegetation was cleared under an approval some years ago with a permit obtained through the *Soil and Land Conservation Act 1945*, which lapsed in 2002. During that process there was extensive liaison between the Government Departments. (Original Approval Number 074/99). Attachment 3.

The limestone on Lot 502 represents one of the few places where this material is available on private land. The site has operated as a limestone pit since 1999 through an Extractive Industries Licence and originally permission to clear through the *Soil and Land Conservation Act 1945*.

Clearing Permit CPS 4782/1 until 12 October 2022 for the current operations.

Proposal

This proposal seeks Development Approval and an Extractive Industries Licence for Agricultural limestone from the proposed extension Lot 502.

An application for a 20 year approval is requested.

1.2 Importance and Rationale

Need for Lime for Mitigating Soil Acidity

The importance of the local lime is recognised in the *Department of Agriculture and Food Bulletin 4760, Survey of Western Australia agricultural lime sources*.

Crushed limestone and limesand is an essential resource to the State, for correcting soil acidity caused during normal farming operations through the use of nitrogenous fertiliser and legume crops. The need for crushed limestone for use as agricultural lime is recognised by the *Department of Agriculture and Food (Bulletin 4784)*.

Acidification of soils is seen as one of the major impediments to continued viable farming in Western Australia. The *State Of the Environment Report Western Australia 2007* shows that about two thirds of the South West agricultural soils are at risk of acidification. When the acidity builds up essential nutrients become unavailable to plants, and the crops reduce in vigour and eventually fail. In addition some other elements such as aluminium become soluble and can lead to toxicity in stock and plants.

The normal method of treatment of soil acidity is to add agricultural limesand and crushed limestone as explained in *Department of Agriculture and Food Bulletin 4784 Soil Acidity, A guide for WA farmers and consultants.*

Abeysinghe, P B, 1998, *Limestone and Limesand Resources of Western Australia, Geological Survey of Western Australia,* Mineral Resources Bulletin 18, also summarises the uses for limestone and lime and the deposits, but does not list the limestone in this locality.

The need to mitigate soil acidity is also reiterated by the EPA. Acidification of soils is cited by the Environmental Protection Authority (EPA) in Section 3.3 of its *State of the Environment Report* as a serious threat to the sustainability of WA soils and agriculture. The report calls for the increased use of lime sand to combat soil acidification and to arrest the menace of sub-soil acidification and its effects on crops, water quality and native vegetation (EPA 2007).

Lot 502 and the surrounding local area is one of the few locations where high grade limestone occurs. The importance of the site is recognised in the *Department of Agriculture and Food Bulletin 4760, Survey of Western Australia agricultural lime sources*. On page 5 of that document it can be seen that the Triple M Transport Limestone at SCLS10 is the only lime source within the Esperance Area. The relevant pages from Bulletin 4760 are attached as Attachment 4.

Data from Bulletin 4660, of limestone from the pit, shows that the typical calcium carbonate content is 70% or over. Tests of the pit have revealed calcium carbonate content of 67% to 78%. (Attachment 4)

Other lime resources, such as the bare dunes to the east have only 40% calcium carbonate.

Lot 502 therefore represents a very valuable community resource.

Crushed Limestone is an essential resource to the State, for correcting soil acidity caused during normal farming operations through the use of nitrogenous fertilizer and legume crops. The need for crushed limestone is recognised by the Department of Agriculture and Food (Bulletin 4784) They have also recognised the importance of this operation in an area of few limestone sources in DAF Bulletin 4760.

To be most effective limestone has to be of the highest grade and, whilst coastal calcareous dunes and limestone do contain calcium carbonate the grades are often too low for efficient and economic use. For example using limestone at half the calcium carbonate content will require double the amount to be excavated, leading to additional land clearing, excavation and transport for no greater gain.

The material on site will be crushed and will form smaller particles of lime than limesand and therefore provide quicker and more efficient sources of $CaCO_3$ than non crushed limesand.

Therefore whilst the grade of the limestone and neutralising value is up to 80% it averages around 75% and with blending it offers substantial savings to the southern agricultural regions because of reduced transport costs.

The draft *State Lime Supply Strategy (2008)* advocates the use of known lime resources especially from those sites which have minimal impact on the conservation values of native vegetation and are well-positioned in terms of existing infrastructure to serve the farming and rural communities (DMP 2008).

The resource has been identified by the Geological Survey of Western Australia which has studied the Limesand and Limestone Resources of Southern Western Australia in Record 2015/7. They did not test the limestone at this location but tested material to the east and at other locations.

The general geology and deposits have been reviewed by the Western Australian Geological Survey and summarised in Abeysinghe 1998.

Some consideration of the use of limestone for agricultural lime and other purposes is shown in the following documents which examined the resources in each area including the availability. The most relevant documents are listed first.

See;

- Geological Survey of Western Australia, 2015, *Limesand and Limestone Resources of Southern Western Australia.*
- Abeysinghe P B, 1998, *Limestone and Limesand Resources of Western Australia*, Geological Survey of Western Australia, Mineral Resources Bulletin 18.
- *Department of Agriculture and Food Bulletin 4660, Survey of Western Australia agricultural lime sources*
- *Department of Agriculture and Food Bulletin 4784 Soil Acidity, A guide for WA farmers and consultants.*
- Geological Survey of Western Australia, 1989, *1 : 50 000 Environmental Geology Series Torbay.*
- Muhling P C and A T Brakel, 1985, *1 : 250 000 Geological Series*, Geological Survey of Western Australia.
- Gozzard J R, 1987, *Limesand and Limestone Resources between Lancelin and Bunbury*, Geol Surv WA, Record 1987/5
- Western Australia, Western Australian Planning Commission*, Statement of Planning Policy 2.4, Basic Raw Materials.*
- Chamber of Commerce and Industry, 1995 and 1996, *Managing the Basic Raw Materials of Perth and the Outer Metropolitan Region*, Parts 1 and 2.
- Chamber of Commerce and Industry, 2008, *Basic Raw Materials Access and Availability*.
- Fetherston J M, 2007, *Dimension Stone in Western Australia*, Volume 1, Department of Mines and Petroleum, Mineral Resources Bulletin 23.

The community need for agricultural lime is indicated by the need for resources to be extracted.

If there no community demand for limestone as a building product and for agricultural use it would be unlikely that this natural resource would ever be utilised for any other purpose and would have no economic significance.

The resource is strategically located and has the potential to provide agricultural lime within the Esperance and wider areas for 20 plus years.

If the resource is not taken from this site it will have to be taken from another site where similar or more land clearing is required. The depth of sand on this site also minimises the area of farm land or vegetation that is likely to have to be cleared on an alternative site. Other resources are much further away and are alos limited along the south coast because of conservation or are very far away at Lancelin, Albany or Augusta.

1.3 Proponent

The proponent is Triple M Transport

Contact is

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Triple M Transport
PO Box 900
Esperance WA 6450

1.4 Landholding

Lot 502	Murray Road, Quallilup, Shire of Esperance

1.5 Description of the Resource

The site covers part of the cliffed coast at Quallilup, 40 km west of Esperance.

The main resource lies in a series of sand dunes at an elevation of 40 – 60 metres AHD.

The limestone consists of a series of overlying and interbedded limesands - limestone varying from calcarenite, a sandy limestone through to limestone of variable calcium carbonate content to calcareous overlying sands.

There is also some recalcified capstone development on the current and older buried soil horizons.

The limestone ranges up to 80% $CaCO_3$ but ranges lower in some beds and,with selection and blending is capable of averaging 75% $CaCO_3$. Due to dissolution of the calcium carbonate the $CaCO_3$ drops inland so that some few hundred metres from the coast the grade is typically 60%, hence the resource is located so close to the coast.

The limestone can be crushed for agricultural lime with the harder material being used for road base.

The limestone on site changes rapidly laterally and vertically through changes in the original dune morphology as does the degree of lithification (hardness). These changes determine the use to which each type of limestone can be put.

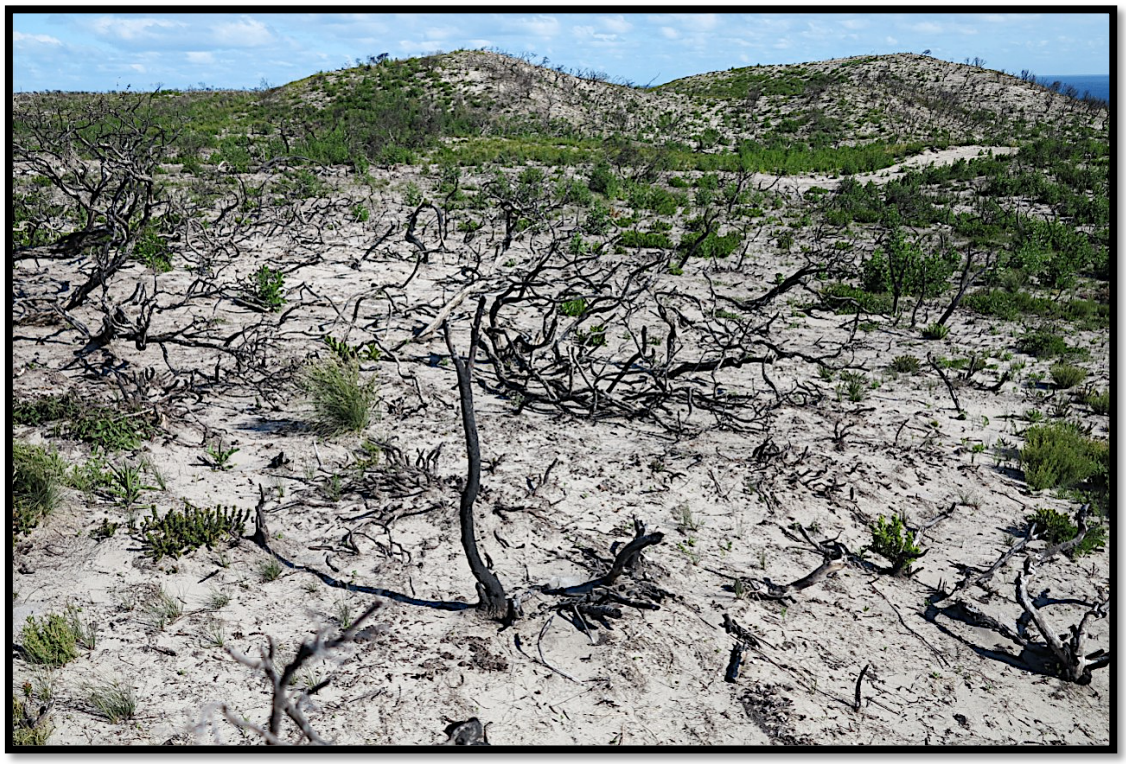

Figure 1 Limestone resource area

Figure 2 Limestone resource

Figure 3 View west across the proposed quarry in the foreground and the existing operations in the middle distance

Although the resource extends to depth, extraction is likely to be initially limited to 8 – 15 metres AHD metres to provide an undulating and consistent final landform and to be consistent with the lower elevations available on site.

An estimated 20 plus years' limestone resources are present, although this depends on the rate of community demand.

1.6 Aims of the Proposal

A major and increasing environmental issue within Western Australian agriculture is the gradual, widespread and increasing levels of acidic soils, created through the use of nitrogenous fertiliser and the growth of leguminous crops. The agricultural industry of Western Australia is one of the most important to our economy through direct value, value added and employment.

Soil Acidification is a well recognised major environmental issue and is highlighted in the various State of Environment Reports on Western Australia, where it is estimated that 55% of the agricultural land in Western Australia is susceptible to the problem. Soil acidification also causes stock toxicity from some metals (eg aluminium) which move into solution in acidic or low pH conditions.

The trend towards acidification of the soils is unavoidable, because legume rotations are best practise farming, and nitrogen is essential for crop growth.

The only mechanism to counteract the increasing acidity is the application of calcium carbonate. The sources of calcium carbonate are limesand, Tamala Coastal Limestone, or other imported limestones, that have to be treated, or dredged lime/shell sand.

Most coastal areas of coastal Limestone are covered by remnant vegetation or are in areas where they are sterilised by increasing numbers of residents.

The aims of the proposal are to;

- Provide reserves of strategically located limestone, suited to a variety of end products.
- Continue to supply lime to the agricultural industry in the Esperance and wider Region.
- Comply with State Planning Policy No 2.5 which requires that basic raw materials should be taken prior to sterilisation of the area by development.
- Enable a smooth transition of extraction to the east of the beach access road.
- Enable continuity of supply through the pit changeover period.
- Enable rehabilitation of the existing limestone pit.

2.0 EXISTING ENVIRONMENT

2.1 Climate

The climate is semi-arid Mediterranean. Climate is recorded at Esperance although local rainfall datais available. Temperatures average up to maxima of around 25 degrees in summer and down to 17 degrees in winter. Minima range from around 15 down to 7 degrees summer to winter.

Rainfall locally is approximately 625 mm per year based on farm data. Most of the rain falls in the months May to August inclusive. Evaporation is approximately 1700 mm per year. (Water and Rivers 1997 WRAP 5).

2.2 Geology and Geomorphology

The site lies approximately 40 km west from Esperance at the end of Murray's Road on the eastern side of Lake Quallilup, 300 metres from the lake and 500 metres from the closest portion of coast.

The elevation of the site is up to 40 - 60 metres. The geology is a series of calcareous dunes that are of variably calcium carbonate content and inconsistently lithified. The dunes, which are interpreted to be up to 20 – 60 metres in thickness, are draped over a steeply undulating granite basement which is not exposed on site. The only exposure of the granite is on the coastal fringe about 1 km south of the pit.

The limestone is a calc-arenite made from beach sand containing predominantly shell fragments with minor and variable quartz. The limestone has been lithified and recrystallised on the ridge tops to lift the percentage of calcium carbonate to over 70%. The limestone sequences also include buried soil horizons and recalcified limestone overtopped by younger dunes.

The degree of lithification (hardness) changes over the property, and determines the use to which each type of limestone can be put.

The limestone is of Quaternary Age formed during changes to sea level during the Pleistocene.

Bores drilled on site, and exposure in the cliffs, show variable depths of limestone of over 150 metres thickness.

2.3 Soils

Soils on the site consist predominantly of grey organic sands in the swales over limestone with white to cream limey sands on the youngest dunes and surfaces.

The soils have been mapped at a very broad scale by CSIRO who categorise them with leached sands, but that is not locally correct.

The soil profile can be seen in the site photographs.

2.4 Hydrogeology

The site lies in the Groundwater Area GWA 16 Esperance, and Water Reserve 10.

The site lies on the eastern edge of a Priority 2 Groundwater Protection Area Esperance near the boundary of Priority 1 to the east. Attachment 2.

There are no production bores in the local area and ground water flow is west and south away from the protection area. Being so close to the coast groundwater will be flowing to the coast and, with the sea water interface near the site, it would be unlikely that a production bore for water would be sited at this location.

Even so the existing limestone extraction and the proposed extraction comply with the Department of Water policies with respect to extraction in Priority Groundwater resource areas.

Limestone excavation is a clean operation similar to sand excavation in the nature of the risk to groundwater. No chemicals are used apart from normal lubricants, which is similar to sand excavation, and sand excavation is one of the few industries that are permitted to operate in a Priority 1 Public Drinking Water Source Area, indicating the clean nature of the activity. See Department of Water *Land Use Compatibility in Public Drinking Water Source Areas.*

Limestone excavation does not affect the quality of water in the shallow ground water system because the only chemicals used are normal fuels and lubricants; a fact that is recognised by the Department of Environment Regulation who permit extractive industries in Priority Groundwater areas such as Lake Gnangara where sand excavation occurs within 3 metres of the water table.

In 1999 the Water and Rivers Commission (now Department of Water) approved the existing quarry. Attachment 3.

There is no surface drainage due to the porosity and permeability of the limestone, with precipitation draining to the water table.

The limestone coastal ridge is 40 - 60 metres.

Lake Quallilup is a permanent lake that is fed via overflow from the Dalyup River feeding into Lake Gore to the north west. It is a saline to brackish lake depending on the volume of water flowing into it.

Lake Gore and reserve land west of Lake Quallilup is classified as a RAMSAR Wetland. Lake Quallilup is not listed as a RAMSAR Wetland but this does not diminish its conservation values. The pit is 300 metres from Lake Quallilup. Quarrying over the past 10 years has not revealed any impact on the lake or any disturbance on the intervening vegetation and habitats.

Rainfall on the proposed excavation area infiltrates vertically downwards to a deep granite basement well below the base of the limestone pit. The base of the pit is at approximately 40 metres AHD.

In locations such as this, adjacent to the ocean and a lake, the water table is normally close to 1 – 5 metres AHD unless perched within a valley of the granite basement. Groundwater flow will either be west to Lake Quallilup or south to the cost if there is a rise in the granite basement west of the pit, although there is no evidence of this.

The base of the pit is therefore some 30 metres above the highest known water table and well within the compliance of the Department of Water guidance of a 3 metre separation between the base of an excavation and the highest known water table in a Priority 1 Groundwater Protection Area.

The pit only operates during the summer months.

It has been estimated that perhaps <10 - 20 % of the rainfall will reach the water table at the processing area with slightly less at the ridge based on the separation to the water table.

2.5 Flora

The vegetation was assessed by the Esperance Wildflower Society in 2000. Since that time the vegetation as been reviewed by Lindsay Stephens of Landform Research but no further study has been able to be completed because the vegetation has been burnt in recent years.

However in the intervening years there did not appear to be any significant changes to the vegetation apart from the burning, which made re-assessment and further complete species identification impossible.

The flora and vegetation is attached as Attachment 1. An additional study closer to the coast was conducted in 2009 which, although outside the area, provides some additional information.

The vegetation is listed as dense Low Coastal Heath typified by *Acacia Cyclops, A. cochlearis* and *A. rostellifera* over *Spyriduium globulosum, Hibbertia racemosa, Melaleuca pentagona, M. pulchella* and *Leucopogon parviflorus*.

The vegetation is typical of the coastal vegetation around much of the south coast. See Attachment 1

The vegetation is classified by Beard 1973, DEC (DER 2012, as;

eaSi, Coastal dune scrub. This equates to Beard Association 42.

There is no *Banksia* Scrub or Proteaceous shrubland or woodlands on the proposed excavation area.

Species List

The vegetation was assessed by the Esperance Wildflower Society in 2000 and 2009. These studies are attached.

The vegetation is listed as dense Low Coastal Heath typified by *Acacia Cyclops, A. cochlearis* and *A. rostellifera* over *Spyriduium globulosum, Hibbertia racemosa, Melaleuca pentagona, M. pulchella* and *Leucopogon parviflorus*.

On the excavation site there are two main vegetation types.

Low Coastal Heath, dominated by the coastal species with reduced proportion of *Acacia* and stunted *Acacia Cyclops* and *Acacia rostellifera*.

In October 2016 the resource area was again reviewed and even though it had been burnt the vegetation was still confirmed as the coastal vegetation types with the species observed by Lindsay Stephens of Landform Research as Coastal vegetation regrowth. Even though the burnt vegetation made identification difficult the following species were observed; and typified by;

Phyllanthus calycinus, Acacia cyclops, Desmocladus flexuosus, Spyridium globulosum, Acacia cochlearis, Muehlenbeckia adpressa, Lepidosperma squamatum?, Melaleuca pulchella, Calothamnus quadrifidus, Anthocercis littorea, Velleia trinervis, Austrostipa flavescens?, Scaevola crassifolia, Goodenia tripartitia

In the more protected swales the proportion and influence of the *Acacia Cyclops* and *Acacia rostellifera* increase to provide a coastal vegetation towards *Acacia* Thicket. The proportion of *Acacia* also relates to fire succession and frequency.

See Attachment 1.

Threatened and Priority Species

Databases held under State Legislation and EPBC legislation were searched.

No plant species or taxa are listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Threatened or Priority Ecological Communities

No Declared Threatened, Priority Species, Significant flora or Threatened or significant ecological communities were identified during the vegetation assessment conducted by the Esperance Wildflower Society.

The Proteaceous dominated vegetation, ***Proteaceae dominated kwongkan shrublands of the south east coastal floristisc provence of Western Australia***, is listed as Threatened under the *EPBC Act 1999*. A Conservation Advice is provided for that plant community and includes extensive species lists. The species lists provided are not typical of those found on Lot 502, which on the resource area is coastal heath.

The ***Scrub heath on deep sand with Banksia and Lambertia, and Banksia scrub heath on Esperance Sandplain*** is listed as Priority 3 Community on State Conservation Lists.

The vegetation on the resource area is not representative of these communities.

See Attachment 1.

Vegetation Representation

The vegetation is listed as Beard Association 42, Shrublands mallee and *Acacia* scrub on south coastal dunes. This is also concluded by DEC (DER) 2012 in the Vegetation Clearing Assessment Report for the existing quarry.

Shepherd et al 2002, Native Vegetation in Western Australia Extent, Type and Status, Department of Agriculture and Food Resource Management Technical Report 249 lists Vegetation Association 42 as having;

> Pre-European extent of 370 327 hectares of which 357 275 hectares remains. This represents 96.5% of the original extent.
>
> Of the remaining vegetation 46.8% is located within IUCN Class I – IV Reserves, 0.0% is located within other Reserves and 0.0% is located within pastoral leases managed by DPAW.

The large areas of vegetation linkages that remain, and will be re-established at the end of mining, can be seen in the figures included in the main report. The success of the rehabilitation to date can be seen in the following photographs.

2.6 Fauna

A fauna study was not conducted because the resource area represents a very small area within a large area of remnant vegetation with only a small area only open at any one time.

A search of NatureMap and the EPBC database was completed by Landform Research and includes the fauna recorded within 10 km and is attached with the Flora and Vegstation Survey.

The small area of proposed disturbances and the large connectivity remaining in place will not cause any isolation of short range fauna.

The Coastal vegetation communities and linkages are protected by maintaining significant vegetation corridor approximately 3 km wide and large buffers to the lakes and ocean. See attached figures.

Stygofauna and Troglofauna

The potential presence of cavities within the limestone has been considered by Lindsay Stephens of Landform Research during the site inspection.

EPA Guidance 54, concentrates on Stygofauna, which occur in caves and “are aquatic subterranean animals, found in a variety of groundwater systems”. Environmental Protection Authority, 2013, *Consideration of subterranean fauna in environmental impact assessment in Western Australia* relates to the level of survey. On the limestone ridge a reconnaissance survey was completed by Lindsay Stephens of Landform Research during the site inspection.

The limestone ridge is not an isolated habitat, but is a very small portion of a long stretch of similar limestone based coastline extending to the east and west. The limestone is Quaternary and therefore young in age with little to no calcrete development. The limestone is also likely to be too young to form significant cavities at the water table.

“Troglofauna occur in air chambers in underground caves or smaller voids”.

The issues of these organisms is best addressed on a risks basis, because the water table is not proposed to be impacted, on, with the base of the pit being approximately 140 metres above the water table. The stockpile area is approximately 15 metres above the water table.

Root mat communities are not known from this area and are unlikely to be present becaue the local geology, regolith and vegetation do not meet the criteria for their occurrence.

2.7 Wetlands

Lake Quallilup is a permanent lake that is fed via overflow from the Dalyup River feeding into Lake Gore to the north west. It is a saline to brackish lake depending on the volume of water flowing into it.

Lake Gore and reserve land west of Lake Quallilup is classified as a RAMSAR Wetland. Lake Quallilup is not listed as a RAMSAR Wetland but this does not diminish its conservation values. The pit is 300 metres from Lake Quallilup. Quarrying over the past 10 years has not revealed any impact on the lake or any disturbance on the intervening vegetation and habitats.

3.0 PLANNING ISSUES

3.1 Current Land Use

The area is remnant vegetation with a small limesand/limestone extraction facility located to the east of the road.

Lake Quallilup lies to the west and is used for recreation. The access road to the beach runs east of the existing excavation and will lie between the existing and proposed excavation.

3.1 Land Zonings and Policies

State Planning Policies

The State Planning Policy Framework provides for the implementation of a planning framework through the recognition and implementation of Regional Planning Policies above Local Planning Schemes and Policies.

Within each layer of planning, there are a number of key policies and strategies to provide guidance to planning and development to enable sustainable communities to develop, expand and prosper without compromising the environment and future generations.

Planning is governed under the *Planning and Development Act 2005.* This Act enables Government to introduce State and Regional Planning Schemes, Policies and Strategies to provide direction for future planning. The State and Regional Schemes sit above Town Planning Schemes and Strategies introduced by Local Government.

Strategies and Policies provide guidance on how planning is to be undertaken and how proposed developments are to be considered. These Strategies and Policies are at the State, Regional and Local levels.

Schemes are gazetted documents that provide for consideration and approval of proposed developments. These are normally at the Regional and Local Level.

In addition to the documents produced under the *Planning and Development Act 2005,* the *Local Government Act 1995* provides Local Governments with a mechanism to prepare Local Laws to manage issues of local significance.

Some policies do have relevance such as the State Industrial Buffer Policy and Basic Raw Materials Policy.

With respect to the supply of sand and limestone, the overarching document is the;

- State Planning Policy 1.0 State Planning Framework.

Complementing this are a number of Relevant State Policies;

- State Planning Policy 2.0, Environment and Natural Resources Policy
- State Planning Policy 2.4, Basic Raw Materials
- State Planning Policy 4.1, State Industrial Buffer Policy

- ***State Planning Policy 2.0, Environment and Natural Resources Policy***

This policy provides for the protection of all natural resources under a number of sections;

5.1 General Measures

5.2 Water Quality including stormwater and wetlands
5.3 Air Quality
5.4 Soil and Land Quality
5.5 Biodiversity
5.6 Agricultural Land and Rangelands
5.7 Minerals Petroleum and Basic Raw Materials
5.8 Marine Resources and Aquaculture
5.9 Landscape
5.10 Greenhouse Gas Emissions and Energy Efficiency.

In addition to recognising the importance of protecting air quality, soil and land quality, water and wetlands and landscapes, the importance of Basic Raw Materials to the community is identified with reference to *SPP 2.4 Basic Raw Materials*, *State Gravel Strategy 1998* and *State Lime Strategy 2001*.

Section 5.7 of SPP 2.0, deals with Minerals, Petroleum and Basic Raw Materials.

Part of Section 5.7 states;

> *Basic raw materials include sand, clay, hard rock, limestone and gravel together with other construction and road building requirements. A ready supply of basic raw materials close to development areas is required in order to keep down the cost of land development and the price of housing.*
>
> *Planning strategies, schemes and decision making should:*
>
> *ii. Identify and protect important basic raw materials and provide for their extraction and use in accordance with State Planning Policy No 10 (2.4); Basic Raw Materials.*
>
> *iii. Support sequencing of uses where appropriate to maximise options and resultant benefits to community and the environment.*

The other factors of the natural environment are provided with the best protection possible, by this management plan, by selection of the site, operational staging and footprint and rehabilitation, bearing in mind the constraints of excavating and processing the resource.

- ***State Planning Policy No 2.5, Agricultural and Rural Land Use Planning***

SPP 2.5 Agricultural and Rural land Use Planning predominantly deals with the continued rural use of suitable land and its protection for the future. The policy was updated in December 2016 and provides strong measures to identify, protect and use basic raw materials.

SPP 2.5 does reiterate the need to protect and use basic raw materials.

Basic Raw Materials are included in the definitions as

> *Sand (including silica sand), clay, hard rock, limestone (including metalurgical limestone), agricultural lime, gravel, gypsum, and other construction materials. The materials may be of State, regional or local significance depending on the resource location, size, relative scarcity, value and demand for the product.*

Amongst seeking to protect agricultural values, Policy Objective 4 (c) states

> *Outside the Perth and Peel Planning regions, secure significant basic raw material resources and provide for their extraction.*

Section 5.9 deals with Basic Raw Materials and seeks to achieve the following in an environmentally acceptable manner;

> *Protect the resources until the resource is extracted (5.9.a)*
>
> *Identify significant basic raw materials on sub-regional and local planning strategies, region and local planning schemes (5.9.b, 5.9.c, 5.9.d)*
>
> *The extraction of basic raw materials should not generally be prohibited (5.9.e)*
>
> *Provide for equential land use (5.9.f)*
>
> *Limit sensitive land uses to locations demonstrated to not limit existing or potential extraction of basic raw materials (5.9.g)*
>
> *Provide for the consideration of native vegetation or significant biodiversity values and may require retention and protection of vegetation and environmental assets (5.9.h)*
>
> *Have regard for the potential impacts of fragmentation and connectivity of native vegetation (5.9.i)*
>
> *Maintain adequate buffers to protect water quality in public drinking water source areas (5.9j).*

SPP 2.5 also supports preventing conflicting land uses (5.12.1), supports the generic buffers recommended by other Government documents such as the EPA Guidelines for separation distances (5.12.3), and seeks to restrict subdivision from impinging on basic raw material resources.

A major aim of the proposal is the removal of sand to lower the soil profile and improve the land capability which, combined with the preservation and use of the sand, which complies with and supports the intent ofthe policy.

The Policy is also supported by Guidelines that seek to protect the Landscape and secure Transport Routes.

- ***State Planning Policy No 4.1, State Industrial Buffer Policy***

SPP 4.1 discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this. The development and processing of the resource has been designed to maintain maximum buffer distances. In situations where the buffers are less, actions such as the provision of perimeter bunding to provide visual and noise management, tree planting and operational procedures, are used to mitigate and reduce impacts.

This is discussed further in Section 2.8.1 Surrounding Landuses and 3.10 Buffers of this document.

- ***State Planning Strategy, 1997***

The Western Australian Planning Commission (WAPC) released the *State Planning Strategy in 1997*. It comprises a range of strategies, actions, policies and plans to guide the planning and development of regional and local areas in Western Australia and assists in achieving a coordinated response to the planning challenges and issues of the future by State and Local Governments.

The State Planning Strategy contains the following five key principles. These are:

- Environment & resources: to protect and enhance the key natural and cultural assets of the State and to deliver to all Western Australians a high quality of life which is based on sound environmentally sustainable principles.

- Community: to respond to social changes and facilitate the creation of vibrant, accessible, safe and self-reliant communities.

- Economy: to actively assist in the creation of regional wealth, support the development of new industries and encourage economic activity in accordance with sustainable development principles.

- Infrastructure: to facilitate strategic development of regional Western Australia by taking account of the special assets and accommodating the individual requirements of each region.

- Regional Development: to assist the development of regional Western Australia by taking account of the special assets and accommodating the individual requirements of each region.

- **Western Australian Geological Survey**

The Western Australian Geological Survey has produced new mapping identifying Strategically Important Basic Raw Materials across private land and State Forest.

This mapping is being extended to the remainder of the State. The resource is shown on the database as adjoining a listed Regionally Significant Limesand Resource and extending under the adjoining vegetation back to the current pit. See the Attached Figures.

Local Government Planning Documents

- ***Shire of Esperance Local Planning Scheme No 23***

The site is zoned Agriculture – General under the Shire of Esperance Local Planning Scheme. The existing excavation and success of rehabilitation has demonstrated that the limestone can be extracted and the land returned to conservation.

The Objectives of the zone do not mention extraction or basic raw materials but rather support agricultural production.

The proposed quarry is selected and designed to minimise impacts, with the past excavation and rehabilitation demonstrating that excavated land can be returned to high quality native vegetation that preserves the conservation values.

Extractive Industries are listed as an “A” Use in the Zoning Table, thereby providing the Shire with potential to approve the development

- ***Shire of Esperance Local Planning Strategy 2006***

The Shire of Esperance Local Planning Strategy provides, in Section 3.10.4, Basic Raw Materials to be identified and protected and identifies clearing and rehabilitation as potential implications.

This proposal complies with the Local Planning Strategy.

- ***Shire of Esperance Extractive Industries Local Law 2001***

The Local Law provides for the control of extractive industries within the Shire of Esperance. The provisions of the Local Law are generally in line with the model text provided by the Department of Planning.

This proposal complies with the Local Law.

3.3 End Use

The planned end use of the site is to restore a natural soil and return the ridge to native vegetation and conservation.

3.4 Responsible Authorities

A number of state and local government authorities are responsible for overseeing the safety and management of the proposed quarry. Other authorities have an interest in the proposal but may not hold any responsibility.

RESPONSBLE AUTHORITY	RESPONSIBILITY AND MANAGEMENT	COMMENTS ON THIS PROJECT
Shire of Esperance	• Provides Planning Consent.	• The site is zoned Agriculture – General under the Shire of Esperance Local Planning Scheme. The existing excavation and success of rehabilitation has demonstrated that the limestone can be extracted and the land returned to conservation. • Extractive Industries are listed as an "A" Use in the Zoning Table, thereby providing the Shire with potential to approve the development
	• Issues the Extractives Industries Licence for the quarry.	• The Local Law provides for the control of extractive industries within the Shire of Esperance. The provisions of the Local Law are generally in line with the model text provided by the Department of Planning. • This proposal complies with the Local Law. • An Extractive Industry Licence was granted by the Shire of Esperance on 30 October 2000 and renewed in October 2001 for a period of 21 years for the existing pit. Shire of Esperance Resolution 0208-1260. A copy of that approval is included in Attachment 3.
	• Local Planning Strategy	• The Local Law provides for the control of extractive industries within the Shire of Esperance. The provisions of the Local Law are generally in line with the model text provided by the Department of Planning. • This proposal complies with the Local Law.
	• Regulates land zonings in conjunction with the Western Australian Planning Commission.	• This proposal complies with the local planning zoning table and provisions.
	• Has control over local roads such as	• In recent years there has been significant

	Murray Road.	negotiation between the Shire of Esperance and Triple M Transport with respect to Murray Road which has been progressively reconstructed and sealed.
Main Roads	• Has an interest in the transport routes and controls major roads such as South Coast Highway.	• The existing transport route will be used
Department of Water	• Issues guidelines for water quality management for extractive industries.	• In 1999 the Water and Rivers Commission (now Department of Water) approved the existing quarry. Attachment 3.
	• Oversees protection of groundwater and water courses.	• The site lies on the eastern edge of a Priority 2 Groundwater Protection Area Esperance near the boundary of Priority 1 to the east. • There are no production bores in the local area and ground water flow is west and south away from the protection area. Being so close to the coast groundwater will be flowing to the coast and with the sea water interface near the site, it would be unlikely that a production bore for water would be sited at this location.
Department of Environment Regulation	• Oversees all aspects of environmental impact and management. • Issues licences for crushing and screening plants. • Provides Approval for clearing under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.*	• A DER Licence will be maintained as required. • Clearing Permit CPS 4782/1 is in place for the existing pit. • A new permit will be applied for to include the proposed pit.
Department of Parks and Wildlife	• Has an interest in the flora and fauna of the area.	• The pit and rehabilitation program has been designed to minimise impact on fauna.
	• The Scrub heath on deep sand with *Banksia* and *Lambertia*, and *Banksia* scrub heath on Esperance Sandplain is listed as Priority 3 Community on State Conservation Lists.	• No Declared Threatened, Priority Flora Species, Significant flora or Threatened or significant ecological communities were identified during the vegetation assessment conducted by the Esperance Wildflower Society. • The species lists provided are not typical of those found on Lot 502 which on the resource area is coastal heath.
Commonwealth EPBC Act 1999	• Oversees the potential for impacts on matters listed under the *EPBC Act 1999*. • No matters of significance under the *EPBC Act 1999* were identified. • The Proteaceous dominated vegetation, Proteaceae dominated kwongkan shrublands of the south east coastal floristisc provence of Western Australia, is listed as Threatened under the EPBC Act 1999. A Conservation Advice is provided for that plant community and includes extensive species lists. The species lists provided are not typical of those found on Lot 502 which on the resource area is coastal heath.	• The species lists provided are not typical of those found on Lot 502 which on the resource area is coastal heath.
Western Australian Planning Commission	• Responsible for structure plans.	• There are no structure plans over the area
	• Responsible for State Planning Policy No 2.5, Agriculture and Rural Land Use Planning.	• The proposal complies with SPP 2.5 which provides significant recognition and support for basic raw material extraction.

Environmental Protection Authority	• Oversees the potential for significant environmental impacts on environmental matters.	• The existing excavations were considered by the Department of Environmental Protection under delegated authority from the EPA under Part V of the Environmental Protection Act 1986. The decision was "Informal Review with Public Advice Given". DEP Reference 147010. Attachment 3. • The decision was appealed and dismissed by the Minister for the Environment on 12 June 2000. Attachment 3.
Department of Mines and Petroleum	• Controls the safety and methods of excavation through the Mines Safety and Inspection Act 1994. • Responsible for overseeing the health and safety of the operations and the administration of the Mines Safety and Inspection Act 1994 and Regulations 1995.	
Geological Survey of Western Australia	• Identifies and seeks to protect Significant Basic Raw Materials.	• The site lies between the existing pit and land identified as regionally significant for limesand. • The mapping is not based strictly on field mapping and drilling which have demonstrated that the limesand extends under the proposed extraction area.
Department of Aboriginal Affairs	• Oversees the *Native Title Amendment Act* and the *Aboriginal Heritage Act 1972 - 1980*.	• No aboriginal sites are recorded.
Department of Agriculture and Food	• Lot 502 and the surrounding local area is one of the few locations where high grade limestone occurs. The importance of the site is recognised in the Department of Agriculture and Food Bulletin 4760, Survey of Western Australia agricultural lime sources. On page 5 of that document it can be seen that the Triple M Transport Limestone at SCLS10 is the only lime source within the Esperance Area. The relevant pages from Bulletin 4660 are attached as Attachment 4.	

3.5 Social Impacts

The main protential social impacts are to perceived local recreation values and the need for lime for agriculture.

The land is private land with Murray Road running within a road reserve through it.

The site lies approximately 40 km west from Esperance at the end of Murray's Road on the eastern side of Lake Quallilup, 300 metres from the lake and 500 metres from the closest portion of coast.

The existing operations have had no impact on Lake Quallilup, and the proposed excavations are further away from the lake. The proposed excavations will not be visible form the beach or from areas of public coastal activities.

The potential for traffic conflicts will be little different to the existing excavation. In recent years Murray Road has been substantially ugraded, therfore assisting in managing potential social impacts. Traffic management through signage and modifying quarry operations will continue to minimise social impacts.

4.0 QUARRYING OPERATIONS

The proposed methods of excavation will be the same as those used on the existing limestone pit used for agriculture lime.

The site was previously used for limestone extraction for road base and a small rehabilitated pit is located on site. Access roads, exploration holes and drill pads are on site.

Limestone will predominantly be used for agriculture, although road base and minor other products will be produced as the higher grade material becomes exhausted. The taking of road base is more likely to be a second phase of excavation by another operator after all the limestone suitable for agriculture has been taken.

Quarry operations will be carried out under the *Mines Safety and Inspection Act 1994 and Regulations 1995.*

Environmental issues including dust, noise and traffic can be managed in such a way to minimise or eliminate any significant impact both on site and offsite. Dust and noise can be contained by the methods of extraction to be used and the control measures which will be put into place. Measures to protect the site and minimise the influence of dieback are addressed under Environmental Management.

Overall the proposed pit is well isolated from any sensitive premises, with none within 1 km.

Project Summary

ASPECT	PROPOSAL CHARACTERISTIC
EXCAVATION	
Area of proposed new excavation	Proposed Pit approximately 16.0 hectares progressively.
Limestone extraction	30 000 to 50 000 tonnes and perhaps 100 000 per year in a particularly busy year
Total estimated resource	Limestone – up to1 000 000 tonnes.
Life of project	10 - 20 years
Area cleared per year	Initially about 2.5 hectares to provide an operational area and then 0.5 hectares – per year depending on the elevation of the ridge.
Total area to be cleared	16.0 hectares in proposed pit progressively. A Clearing Permit will be required.
Area mined per year	0.5 hectares approx.
Dewatering requirements	None
Maximum depth of excavations	15 metres, but depends on the depth of the high grade limestone which may extend deeper
PROCESSING	
Limestone	Same as the amount extracted.
Water requirements	Only required for dust suppression in excessively dusty situations, on site transport and processing. The limestone will be moist when extracted and will not need dust suppression. Water for dust suppression has not been required in the past operations
Water supply source	Local farm water supply if required, from Lot 502.
INFRASTRUCTURE	
Total area of plant and stock	Mobile plant will be used, located within excavation footprint.
Area of settling ponds	Not required
Fuel storage	Not required, mobile tankers will be used
TRANSPORT	

Truck movements	Variable but approximately 10 laden trucks per day maximum depending on the volumes of limestone extracted. Based on a 40 tonne load and 50 000 tonnes per year.
Access	Continued access along Murray Road.
WORKFORCE	
Construction	2 - 3
Operation	2 - 3
Hours of operation	Monday - Saturday 6.30 am to 5.00 pm excluding public holidays. Generally in the months December to March annually.

Figure 4 View across the existing limesand resource

Figure 5 View north from the proposed excavation area

Figure 6 View north from the proposed excavation area

4.1 Limestone Extraction

Limestone extraction will generally only be during the summer and autumn months for agricultural lime. Actual quantities will depend on the type and size of contracts won, and sales. It may be more efficient to provide a year round operation, making road bases in the off season for agricutlural lime.

1. Vegetation cleared will be utilised for rehabilitation of the completed pit. See Section 5.9 Rehabilitation.

2. An Application for Clearing will be required with this application to cover the remnant vegetation on site. A Clearing Permit exists for the current site, CPS 4782/1.

3. The excavation footprint has been determined from Landgate contour mapping, field mapping, drilling and sampling, combined with detailed aerial photography.

4. Remove the vegetation cover using loader, by pushing it into windrows for use on the batters and rehabilitation areas, to minimise soil erosion and assist spreading on the final land surface as part of the final rehabilitation.

5. Where practicable vegetation will be directly transferred to an area being rehabilitated. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable; for example on batter slopes of completed areas.

6. If direct transfer is not possible the vegetation will be stored in dumps, mulched or swapped with a nearby operator to try and ensure that the material is not wasted.

7. All topsoil will be removed for spreading directly onto areas to be revegetated and screening or perimeter bunds. If direct spreading is not possible the top soil will be stored in low dumps, for spreading at a later date. See 5.9.2 Rehabilitation Procedures.

8. Soil and overburden, as dark grey to black sand sand and low grade limestone, will then be removed and either directly transferred to a rehabilitation area or stored in low dumps for later rehabilitation use. Where this is not used overburden will be stored in dumps for future use in rehabilitation or the creation of bunds.

9. Limestone interburden, if encountered, will be incorporated into the overburden dumps for later use in re-contouring the land surface at the conclusion of excavation.

10. The limestone is relatively soft and can be removed with an excavator or loader without the need for a bulldozer or blasting. On occasions it may be safer for a bulldozer to be used.

11. A bulldozer may be used to rip and push the limestone down the excavation face and track roll the limestone in the process if the limestone becomes hard or to increase levels of safety.

12. The preliminary crushed limestone will then be picked up by a rubber tyred loader and fed to the mobile crusher.

13. Excavation will commence on the western ridge, working on the floor of the pit behind the faces to prevent visual impact.

14. Upon completion of each section of quarry the excavated section will be reformed and back filled, where subgrade material is available, to achieve the proposed final contours which will replicate an undulating pre-mined landform.

15. It is not anticipated that blasting will be required.

16. At the end of excavation the floor of the quarry will be deep ripped, covered by overburden and top soil, and rehabilitated to a constructed soil. Details of the Rehabilitation are listed under 5.9 Rehabilitation.

Processing

All screening and crushing equipment is mobile and brought to the site as needed. The necessary Licences for the equipment will be obtained from the Department of Environment Regulation for all plant used on site as required.

A mobile crushing and screening plant will continue to be used to break down the limestone to small fragments to increase the surface area and make the material more readily soluble when applied to agricultural land. Currently this is located in the existing pit and will remain in that pit until sufficient ground has been opened for operations to be transferred to the proposed eastern pit.

All static and other equipment, such as crushers and screens (where used), will be located on the floor of the quarry to provide visual and acoustic screening.

4.2 Staging and Timing

At this stage it is difficult to predict the speed of excavation because the amount of material extracted depends on market conditions.

30 000 tto 50 000 tonnes of limestone are anticipated to continue to be extracted in a year depending on market demands with up to 100 000 tonnes in a particularly busy year.

This proposal seeks Development Approval and an Extractive Industries Licence for a staged extraction area of approximately 16.0 hectares combined with a stockpile and processing area of 3 hectares remaining on the existing pit prior to transfer to the eastern pit. At any one time it is anticipated that only 5 hectares of pit will be open.

However it is expected that the quarry will progress by up to 0.5 – 1.0 hectare per year. Over ten to twenty years of resource is anticipated to be available on site.

Depth is anticipated to be 8 – 15 metres, but higher grade limestone may extend to depth in places.

The active area needs to be large to enable a range of limestone products to be available at all times, and to provide sufficient area for processing/screening and for stockpiles.

Wherever possible all completed ground will be rehabilitated as soon as possible to ensure that the amount of ground that is open at any one time is minimised. The nature of the excavation means that it will be difficult to commence rehabilitation of the floor of the quarry until the underlying limestone has been removed.

4.3 Hours of Operation

Hours of operation will continue to be 6.30 am to 5.00 pm Monday to Saturday inclusive, excluding public holidays. The limestone extraction is mainly undertken in December to March annually.

Transporting material on Saturday is requested to enable farmers to access lime in the autumn period prior to sowing their crops.

4.4 Access and Security

Access to the site will continue to be from South Coastal Highway and then along Murray Road.

In recent years there has been significant negotiation between the Shire of Esperance and Triple M Transport with respect to Murray Road which has been progressively reconstructed and sealed.

The existing perimeter security measures will be maintained with fences and locled gates in strategic locations. Warning signs will be maintained as required by the Department of Mines and Petroleum and the Shire of Esperance.

4.5 Equipment

All static and operational equipment will work on the quarry floor to provide maximum sound and visual screening.

Site office	A mobile or transportable office may be required at the stockpile area.
Toilet system	Portable serviced system will be used.
Bulldozer	Removal of limestone rubble and road base, track crushing of limestone as required and pushing down the resource on steeper slopes and where it is more efficient or the limestone is harder.
Excavator	Will normally be used to remove limestone.
Crushing and Screening plant	Preparation of road base and agricultural lime using mobile crushing and screening plant.
Water tanker	Used for dust suppression on the access roads and working floors as necessary. Not likely to be required for most of the year or at all.
Loader	Loading and handling materials from the stockpiles.
Fuel Storage	Refuelling will either be undertaken using mobile tankers.

4.6 Final Contours

The slope of the final contours of the proposed pit is an undulating surface at around 8 metres below the existing land surface.

Slopes of the batters at the end of excavation will be retained at between 1 : 2 to 1 : 4 vertical to horizontal which has been demonstrated by past excavation to be stable and able to be rehabilitated.

4.7 Workforce

The workforce will vary, depending on the level of operation and market demands, but usually 2 to 3 persons can be expected to be working on site.

4.8 Water Usage

Water is unlikely to be required for dust suppression, apart from dry summer times of active areas such as the stockpile area.

The limestone will stay moist when excavated and crushed and screened.

It is not anticipated that water will be required for dust suppression because of the location and climate with rainfall through all months.

However a contingency remains for excavation and processing which will be carried out as required during drier weather.

Potable water will be brought to the site as required.

4.9 Transport Corridors

Lime products are to be transported from this site through summer and autumn (December to March).

Access to the site will continue to be from South Coastal Highway and then along Murray Road.

In recent years there has been significant negotiation between the Shire of Esperance and Triple M Transport with respect to Murray Road which has been progressively reconstructed and sealed.

Transport from the site is likely to be via a variety of trucks depending on the contractor and the type of product carried; such as semi-trailers or rigid (8) wheeler trucks to a 5 axle dog trailer. At times when road making materials are being transported from the site the number of truck movements may be greater.

However for the most efficient long distance transport pocket road trains are used by most cartage contractors. Their use will depend on road conditions.

Traffic volumes along the access road is anticipated to be around ten - twenty laden truck movements per day for 50 000 tonnes of material. During busy times there can be greater numbers of laden trucks and on quiet days less traffic.

Normally the trucks transport agricultural lime first thing in the morning with a smaller number around lunchtime depending on the transport distance.

If the volumes extracted and sold increase so will the number of truck movements, but still they will normally have a peak around start time and a smaller peak at lunch time with few to none at other times.

When transporting road base to local areas there may be more movements at the non peak times.

The destination of the lime is normally in the Esperance and nearby Regions and any truck will normally only access the site once on any day. Some trucks may access the site twice per day where the destinations are close by.

The access and internal roads will continue to be limestone based and watered as needed in the drier months to suppress dust.

Quarry self imposed speed restrictions are normally placed on the road with 80 kph on sealed sections of Murray Road and 60 kph on the unsealed sections of the road.

Normal traffic speeds will be used on to the roads.

Quarry Traffic

There will be traffic management for the quarry haul road traffic and traffic along the beach access road.

4.10 Safety

Excavation will continue to be conducted to *Mines Safety and Inspection Act 1994 and Regulations 1995.*

Health and safety issues are overseen by the Department of Mines and Petroleum and a Project Management Plan has been approved for the current operations and will carry through to the new operations.

The existing operations are registered under the Department of Mines and Petroleum SRS system.

Regular inspections and audits will be carried out by officers of the Department of Mines and Petroleum to inspect safety, operational procedures and workplace health such as dust and noise.

Triple M transport have procedures in place to manage safety, health, environmental impact, site completion and rehabilitation. All workers are required to wear full protective safety and high visibility gear when on site.

This includes Safety Management Plans and a site specific Emergency Response Plan to cover operational procedures, which include workforce induction and training to ensure that all employees involved are made aware of the environmental and safety implications associated with all stages of the mining activities.

Workers and staff on all sites are trained in the use of the procedures and all employees provided with site induction and training as necessary prior to commencing work on the site.

All vehicles and trucks will be equiped with two way radio capability.

No light vehicles are permitted on site without registering with mobile plant on site. Full personal protection is required for all persons on site at all times.

The site is to be registered under the Department of Mines and Petroleum SRS reporting system for minesites and quarries.

It is anticipated that the deepest excavation will be a maximum of approximately 8 metres below natural ground level.

At all times excavation will be in compliance with the *Mines Safety and Inspection Act 1994 and Regulations 1995.*

Fencing, locked gates and warning signs will be maintained.

The batter slopes of the pit will be dozed or pulled down at between 1 : 1 and 1 : 2 which will prevent any fall situations during excavation.

Even though the site is remote and on private property, fences will be constructed around the top of any face, installed with warning signs. The fence will be approximately 1.2 metres high and of wire farm type construction.

Emergency

The site is within mobile phone contact and all vehicles will be equipped with two way radios. Safety management and operating procedures will be in place.

Fire

Fire risk is less than the risk from general farming. The open area of excavation forms a natural firebreak and will be used for the emergency muster area.

Fire Safety is incorporated into safety management for the site.

The site is within mobile telephone range which will assist in fire safety.

Earth moving vehicles, and the water tanker, when on site during excavation, are available for fire fighting if required. Operators are trained in the use of fire extinguishers for all types of fire.

Perimeter fire rural fire breaks are maintained, with the existing access road along the eastern fence of Lot 502 forming a fire access break.

Final contours of the batter slopes will be 1: 2 to 1 : 4 vertical to horizontal with the floor of the excavation left as gently undulating around 8 metres below the existing land surface

SAFETY			
Potential Impact	**Management**	**Outcome Commitments**	**Action Required**
Operational Safety	*Mines Safety and Inspection Act 1994 and Regulations 1995.* ▪ The site is within mobile and landline telephone contact. ▪ Safety Management procedures will be implemented prior to commencement. ▪ All workers will be provided with site induction and necessary training prior to entering the site.	The proponent is committed to maintaining a safe working environment and have standard Safety Management Plans for their operations.	Compliance with *Mines Safety and Inspection Act 1994 and Regulations 1995.* Ongoing
Adjoining properties	*Mines Safety and Inspection Act 1994 and Regulations 1995.* • Warning signs will be erected around the operating area. • Locked gates and fences will be maintained on site.	The proponent is committed to maintaining a safe working environment and has standard Safety Management Plans for its operations.	Compliance with *Mines Safety and Inspection Act 1994 and Regulations 1995* Compliance withoperating conditions

5.0 ENVIRONMENTAL IMPACTS AND MANAGEMENT

5.1 Surrounding Landuses and Buffers

A number of Government Policies relate to buffer distances and the protection of basic raw materials. State Planning Policy No 4.1, State Industrial Buffer Policy, (draft July 2004) discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this.

Generic buffer requirements were developed by the Victorian Government and used by the Environmental Protection Authority as the basis for a Draft guideline on recommended buffer distances. These formed the basis of EPA Guidance Statement Number 3, Separation Distance between Industrial and Sensitive Land Uses, June 2005.

The main issues are the potential generation of dust and noise, which are addressed later.

The Environmental Protection Authority of South Australia recommends a 300 metre separation for a Quarry - Non Blasting.

EPA guidance "Separation Distances between Industrial and Sensitive Land Uses", June 2005 lists the generic buffers for sand and limestone pits as 300 - 500 metres depending on the extent of processing. A generic buffer relates to the distance at which there are unlikely to be any problems without some further investigations and does not mean that smaller buffers are not acceptable. EPA Guidance for the Assessment of Environmental Factors 3 June 2005 provides for a case by case separation, based on the potential impacts.

EPA 2015 Draft Separation Guidance recommends a generic buffer distance of 500 – 1000 metres for crushing operations in the absence of site specific studies. A generic buffer distance of 300 – 500 metres is recommended where no crushing or screening is required. This extends out to a generic buffer of 1 000 metres where crushing and screening are involved.

State Planning Policy No 4.1, State Industrial Buffer Policy recommends that all land uses within 1000 metres be considered.

These are generic buffers and can be varied on the basis of environmental and management studies.

The same type of quarrying therefore has very different generic buffers developed by State Environmental Protection Authorities, illustrating the need to consider separations on on-site environmental impact and not theoretical or generic buffers.

State Planning Policy 2.5 defers to published Government buffer policies such as the EPA buffer guideline.

The continued limestone extraction complies with the EPA generic buffer and other buffer recommendations and policies. There are no nearby dwellings.

5.2 Aesthetics

Visual impact can occur in a number of circumstances, by the operation being set too high in the landscape, by being too close to neighbours and by insufficient visual protection.

The limestone resource of the highest grade is closest to the coast on the highest ground at an elevation of around 40 to 60 metres AHD.

However excavation and all activities can be conducted in a manner that makes it unlikely that the operations will be seen from public areas or roads with effective visual management which is proposed. There are no nearby dwellings.

The most relevant visual management guideline is WAPC 2007, *Visual Landscape Planning in Western Australia* which has been viewed and the project considered against that document. The relevant section is Part Three, pages 144 to 152 of the Guideline.

That document recommends a visual impact assessment, which has been completed using contours and sections, in addition to site observations and aerial photography. The context of the visual impact has been reviewed to try and maintain the natural countryside and minimise visual impact.

Section 5.2.5 of the Guideline provides for "extractive industries and utilities". The main directions are;

- *the location of facilities to provide maximum screening*
- *entry points that are not at significant view points*
- *signage is visible but minimal*
- *visual management assessment may be required.*

By excavating from the west, with perimeter bunding, the operations in the pit will not be visible. The stockpile area will be located in the base of the pit where it can be screened by the design of the access road and the intervening vegetation.

The limestone will be extracted from a ridge and will result in the two dunes being reshaped down to the elevation of the intervening swale. The main ridge line will not be modified in an un-natural way with the excavated land surface being similar to other parts of the coastal cliffs.

There are a number of management actions that can be taken in quarries to minimise visual impact and these will be used wherever possible.

The general management actions are summarised below together with the visual impact issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise visual impact.

It is felt that the operations are unlikely to be seen from any public location becaue of the way the pit and stockpile area are designed.

Below is a list of ideal visual management activites with a simple compliance audit for the operations.

IDEAL OPERATIONAL PROCEDURES	COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE
• Locate exposed features behind natural barriers and landform.	• The quarry will be located behind perimeter bunding along the boundary of the road, in a manner similar to the existing quarry to the west which is not generally visible from the road. • Excavation will work from the west.

	• Processing will continue to take place on the floor of the existing pit. The stockpiles will similarly be located on the floor of the pit. • As the pit enlarges processing and screening will be moved from the existing operations to the new pit and the existing pit closed and rehabilitated. • The proposed pit is to be set back from the beach and coast and will not be visible from either.
• Operate from the floor of the pit below natural ground level.	• The pit is to be worked from the inside out, below natural ground level initially via an internal haul road to the processing and stockpile area. • The processing area is to be located on the floor of the pit in the most efficient, safest location that provides the best visual management. Until the pit is enlarged that will be in the base of the existing operation. • Over time as the pit progresses the mobile processing plant will be moved around and across the floor of the pit and when the new pit is sufficiently large, to the floor of the new pit.
• Avoid breaks in the skyline due to workings and haul roads.	• Excavation will come from the west. The main ridge will not be altered and the skyline will not appear to change significantly, although it will be lowered slightly in a localised area • There are no sensitive premises or locations from which people are likely to see the pit with the pit being protected by bunding from the road to the beach.
• Push overburden and interburden dumps into positions where they will not be seen or can form screening barriers.	• Perimeter bunds of overburden and natural face are to be used to increase the visual and other screening.
• Construct screening bunds and plant tree and shrub screens to reduce visual impact.	• Screening bunds and natural vegetation will be used as overburden is removed.
• Stage workings and progressive rehabilitation to provide visual protection of later activities.	• The staging of the pit footprint is designed to minimise visual impact with special attention concentrating on the sightlines. • The pit will be excavated from west to east and north.
• Cover barriers and landscaping with forms, colours and textures compatible with the natural environment.	• Natural vegetation will be retained around the perimeter.
• Adopt good house cleaning practices such as orderly storage and removal of disused equipment or waste.	• Triple M Transport will continue to maintain a tidy work environment at all their sites. Waste is regularly removed off site to an approved waste facility. • Where possible usable materials will be recycled which is part of normal operational procedures.
• Provide progressive rehabilitation of all completed or disturbed areas.	• This has always been used on site and is proposed. • Such rehabilitation is in place at the old excavations and cut slopes that demonstrate that rehabilitation can be effective with good topsoil and vegetation management. • Areas not required will be revegetated when each part of the site has reached its final form.
• Minimise the amount of ground used at any one time.	• The amount of ground used will be minimised to that needed for current and future operations and fluctuations.

Light Overspill

No night activities are proposed.

Visual Management - Applicable Legislation / Policies
• None applicable
Commitments to Visual Management
• The proponent is committed to management of visual impact and will implement the measures outlined. • Every effort will be made to minimise the visual impact using appropriate methods from those listed above.

5.3 Noise

Offsite noise is governed by the *Environmental Protection (Noise) Regulations 1997.*

The *Environmental Protection (Noise) Regulations 1997*, require that sensitive premises including dwellings in non industrial and rural areas, are not subjected to general noise levels (excluding blasting), during the hours 7.00 am to 7.00 pm Monday to Saturday that exceed 45 dBA. Allowable noise to 55 dBA is permitted for up to 10% of the time and to 65 dBA for 1% of the time. Noise levels are not to exceed 65 dBA during normal working hours.

Between 9.00 am and 7.00 pm on Sundays and Public Holidays and between 7.00 pm and 10.00 pm on all days the base level is 40 dBA.

At night, between 10.00 pm and 7.00 am Monday to Saturday, and before 9.00 am on Sundays and Public Holidays, the permitted level drops to 35 dBA.

The 10% and 1% “time above” allowances apply at night and on Sundays and Public Holidays as well.

There are penalties for tonality of 5 dB, modulation 5 dB and 10 dB for impulsiveness, that are added to the permitted levels. That is, if the noise is tonal or modulated the permitted levels drop by 5 dB. Impulsiveness is not likely to be relevant for the quarry under normal circumstances.

Influencing factors of external noise and nearby land uses such as busy roads, and industrial properties are not applicable to this site.

At a distance greater than 15 metres from the sensitive premises (eg dwelling), and commercial premises a base level of 60 dBA applies at all times with the 10% time permitted to be up to 75 dBA and the 1% permitted to be up to 80 dBA. For Industrial premises the base level is 65 dBA at all times with the 10% time permitted to be up to 80 dBA and the 1% permitted to be up to 90 dBA.

Gazetted and public roads are exempt from the Noise Regulations.

Noise can originate from a number of operations and may impact on onsite workers, or travel offsite and impact on external sensitive premises. Both potential noise impacts are addressed by reducing the noise generated from the quarrying and processing operations.

There are a number of management actions that can be taken in quarries to minimise noise generation or travel.

These actions are routinely used in quarries where applicable and as the opportunity presents to minimise noise on site.

The proponent will comply with the *Environmental Protection (Noise) Regulations 1997.*

There are no known sensitive premises within 1 km which complies with the EPA Guidelines. The local private land is held by the proponent and there is no risk of any new dwellings being constructed in the local area.

Occupational Noise

Occupational noise associated with the quarrying processes falls under the Mines *Safety and Inspection Act 1994 and Regulations 1995*.

The management of occupational noise is normally handled by providing all necessary hearing protection, as well as conducting worker inductions and educational programs for all staff. Regular site audits of quarry and mining operations are normally conducted by the Department of Mines and Petroleum.

As part of its commitments, the proponent will be pro-active with its worker safety awareness;

- by providing all necessary safety equipment such as ear protection,
- identifying sections of the plant where hearing protection is required, as well as,
- conducting induction and educational programs for its staff.

The operating noise levels around the site are regularly monitored by independent consultants in accordance with the *Mines Safety and Inspection Act 1994*, and the results communicated to the Department of Mines and Petroleum (DMP). All staff are provided with comprehensive ongoing training on noise protection as part of the commitment to occupational health and safety.

The DMP conducts Occupational Noise Audits of the Operations, on all operations.

Warning signs are to be used to identify areas of potential noise for workers.

All static and processing equipment will be located to provide maximum noise screening, behind bunds if sufficient overburden is available. Excavation will be staged from the west and south, behind the ridge to provide continuous noise screening.

Not all equipment operates at the same time. Similarly not all resources will be worked at the same time.

Warning signs are to be used to identify areas of potential noise.

IDEAL OPERATIONAL PROCEDURES	COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE
• Comply with the *Environmental Protection (Noise) Regulations 1997.*	• The proposed operations are so far from any dwelling, > 1 km and screened by the eastern and northern faces, that they will comply with the Regulations.
• Comply with the provisions of the *Mines Safety and Inspection Act 1994 and Regulations 1995*.	• Like any quarry, the operations will be regularly inspected by officers of the DMP.
• Maintain adequate buffers to sensitive premises.	• The quarry complies with the Generic EPA Buffer Guidelines. • There are no dwellings within 1000 metres.
• Locate exposed features behind natural barriers and landform.	• Bunding along the western and southern perimeters will provide screening even though the operations will continue be located on the floor of the pit.

• Operate from the floor of the pit below natural ground level.	• This will continue to be used.
• Push overburden and interburden dumps into positions where they can form screening barriers.	• Perimeter faces, overburden dumps and natural vegetation are proposed.
• Design site operations to maximise the separation and protection from sensitive premises.	• The shape of the pit, setbacks and method of operation have been designed to ensure landform protection is to be maximised.
• Maintain all plant in good condition with efficient mufflers and noise shielding.	• Efficient equipment that is maintained in good condition and replaced from time to time will be used.
• Maintain haul road and hardstand surfaces in good condition (free of potholes, rills and product spillages) and with suitable grades.	• The access road will be maintained in good condition.
• Implement a site code outlining requirements for operators and drivers.	• A site induction and training program for all personnel is to be implemented and maintained.
• Shut down equipment when not in use.	• This is normal policy.
• Scheduling activities to minimise the likelihood of noise nuisance.	• Activities are proposed to minimise impacts on the local community.
• Fit warning lights, rather than audible sirens or beepers, on mobile equipment wherever possible.	• Lights or low frequency beepers are to be used rather than beepers. • The design and shape of the pit will maximise noise screening.
• Use transport routes that minimise community disruption.	• There is only one road (Murray Road) to access the site, so trucks will be specifically instructed to minimise impacts on the local community. • Gazetted roads such as Murray Road are exempt from the Noise Regulations.
• Avoid the use of engine braking on product delivery trucks in built up areas.	• The surrounding area along the transport route is generally flat with reduced gradients. • Air brakes are unlikely to be required. • Drivers will continue to be instructed not to use air brakes under normal situations.
• Minimise and conduct at the least disruptive times, non day to day activities such as vegetation, topsoil or overburden stripping on exposed ridgelines.	• The hours proposed are designed to minimise impact.
• Provide a complaints recording, investigation, action and reporting procedure.	• A complaints recording procedure is proposed to cover all site activities.
• Conduct training programs on noise minimisation practices.	• Site induction and training to all personnel is proposed.
• Provide all workers with efficient noise protection equipment.	• All noise protection personal equipment will be provided to staff.

• **Noise Management - Applicable Legislation / Policies** • *Environmental Protection (Noise) Regulations 1997.* • *Mines Safety and Inspection Act 1994 and Regulations 1995.* • *Australian Standard AS 2187.*
Commitments to Noise Management • The proponent is committed to minimising noise emissions and will implement the measures outlined above. • The proponent will comply with the *Environmental Protection (Noise) Regulations 1997.*

5.4 Dust

5.4.1 Environmental Dust

Background

The existing pit has operated for sixteen years without any noticeable impacts of dust on the local community or adjoining vegetation.

Excessive dust has the potential to impact on both the workers and the adjoining land. However the potential generation of dust must be taken in context.

There are a number of key aspects to dust impacts;

- What is the source of particles?
- What is the potential for the particles to be disturbed?
- What is the nature of the particles and how are they likely to behave?
- What types of impacts are the particles likely to have if they move?
- What management actions can be used to mitigate or reduce dust impacts?

The most common form of disturbance is by mobile plant and vehicle impacts. In this local area dusty roads have the most potential to produce dust, such as the access road, and depending on the substrate, traffic on the pit floor.

In many situations the fine particles are stablised by vegetation, soil microbial materials and reactions and interactions between particles, particularly limestone of the access road which crusts after being wet but breaks up when trafficked, producing dust.

Once disturbed however dust can be generated and may continue to be a problem until the fine particles are wetted down or return to a relatively stable condition. With effective treatment of dust by water, which is proposed, the risks of onsite, and consequently offsite, dust are minimised.

Excessive dust has the potential to impact on both the workers and the adjoining land. However if occupational dust is managed environmental dust will also be managed.

Occupational dust associated with the quarrying processes falls under the *Mines Safety and Inspection Act 1994 and Regulations 1995* overseen by the Department of Mines and Petroleum who will regularly inspect the site.

5.4.2 Assessment of Dust Risk

Dust Guidelines

Dust emissions fall under the *Guidance for the Assessment of Environmental Factors, EPA, March 2000*. Assessments of the potential dust risk are normally made using the Land development sites and impacts on air quality, *Department of Environmental Protection and Conservation Guidelines, November 1996.* These are still in place but are incorporated into the *DEC (DER) 2011 Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities.*

The *DEC (DER) in 2008* released a *draft Guideline for the Development and Implementation of a Dust Management Plan.*

The setbacks provide effective dust management and comply with the EPA generic buffer guidelines and Department of Health Guidelines.

Onsite Risks

There are no offsite risks impacting on sensitive premises as these are too far away.

There is a risk of dust generation from the access road and from dust being dragged onto Indian Ocean Drive. These risk are similar to the risks from any unsealed road.

Limesand is calcium carbonate based and is not known to carry any significant health risks to workers based on other operations and recreational use of limesand dunes. Being Aeolian in origin the grainsize is greater than the particulate sizes that impact on occupational health.

The key Objectives for the operations are;

- Manage the potential for the generation of dust.
- Visually monitor dust levels and take steps to reduce the potential impact of dust on occupational and environmental aspects of the operation and local area.

5.4.3 Buffers

The setbacks to sensitive premises comply with the EPA generic buffer Guidelines for all operations as noted in Section 6.2 Surrounding land Use in the Mining Proposal.

EPA guidance "Separation Distances between Industrial and Sensitive Land Uses", June 2005 lists the generic buffers for sand and limestone pits as 300 – 1000 metres depending on the extent of processing. The minimum separation distances are over 1 km, well in excess of the EPA generic buffer. There will be no smaller buffer than currently exist and there have been no significant adverse dust effects during past operations.

Dust particles are readily stopped by tree belts and distance, with which the site complies. Tree belts slow the wind and allow the dust to settle. See *Planning Guidelines Separating Agricultural and Residential Land Uses, Department of Natural Resources Queensland 1997(Pages 65 – 111) and Department of Health WA, 2012, Guidelines for Separation of Agricultural and Residential Land Uses which uses the same criteria (Pages 112 – 118).*

The Queensland Guidelines predominantly relate to agricultural spray drift, but based on particle size also relate to dust. They are based on field studies and demonstrate the effectiveness of tree belts and distance in providing screening against particulate travel.

The Guidelines provide for a buffer of 300 metres for open agricultural land, dropping down to 40 metres where an effective tree belt is in place. The Western Australian Department of Health also uses the same guidelines.

Whilst there are no tree belts the distances involved ensure that the operations comply with the Department of Health buffer recommendations.

5.4.4 Occupational Dust

The proponent will provide induction and protective equipment for all persons on site.

The DMP require personal dust monitoring to ensure dust levels comply with health risk guidelines.

The dust management procedures used on site comply with these guidelines.

5.4.5 Actions and Management

Dust management therefore applies to the access road which is no different to any non sealed road.

There are a number of management actions that can be taken in quarries to minimise dust generation or travel and these are used wherever possible. The general management actions are summarised in the tables below, together with the potential dust issues that relate to this site.

The actions are used where applicable and as the opportunity presents to minimise dust on this site for the current operations and will be also applied to the new excavations.

Loads on trucks that have the potential to generate dust are required to be covered.

DESIGN AND SITE

1. Minimising the amount of ground open.
2. Minimising the amount of ground being subject to traffic.
3. Locating access roads away from sensitive premises.
4. Design of the pit to reduce wind speed and potential dust lift off.
5. Maintaining effective setbacks.
6. Constructing perimeter bunds to reduce wind speed.
7. Providing wind break fencing generally and on top of bunds as required.
8. Maintaining a secure, fenced site, to prevent illegal access.
9. Rehabilitate and stabilise all completed areas as soon as practicable.

OPERATIONS

10. Locate active areas away from windy locations.
11. Working on the floor of the pit.
12. Operate some parts of the pit only when conditions are suitable.
13. Locating mobile plant and stockpiles in sheltered areas.
14. Design staging to minimise dust risk.
15. Conduct higher dust risk operations such as topsoil clearing and placement during more favourable conditions.
16. Shut down equipment that is not required.

ACCESS AND HARDSTAND

17. Constructing the access roads from hard materials that resist dust generation.
18. Using water as required to reduce dust risk.

STOCKPILES

19. Minimise the number of stockpiles.
20. Maintain stockpiles in sheltered areas.
21. Reduce the elevation of stockpiles.
22. Limit the drop height to stockpiles and loading.

TRANSPORT

23. Cover all loads.
24. Ensure all trucks are dust free and not carrying particles and other materials outside the tray.
25. Choose the best transport routes after leaving the South Coastal Highway.
26. Wet down the access road if required.

HEALTH AND COMMUNITY

27. Maintain air conditioned cabins on all vehicles.
28. Provide a readily auditable trigger of no visible dust to cross the property boundary in line with DER Licence and best practice in WA.
29. Provide a comprehensive visual monitoring program.
30. Conduct effective site induction and awareness training for all staff.
31. Training should include observation and mitigation where possible of all dust emissions.
32. Providing a complaints investigation, mitigation and recording procedure.
33. Liaising with Main Roads and the Shire of Esperance as and when required, which continues the past practices.
34. Ceasing operations when conditions are not favourable or when visible dust is crossing the boundary.
35. Obtain the latest weather conditions to increase the awareness of dust risk.
36. Cease operations during adverse weather conditions.

5.4.6 Dust Management Actions - Risk

ACTIVITY	POSSIBLE RISK SEVERITY and FREQUENCY	OPERATIONAL PROCEDURES AND COMMITMENTS	RISK AFTER MANAGEMENT
GENERAL			
Legislation	----	• The proponent will comply with the provisions of the *Mines Safety and Inspection Act 1994 and Regulations 1995.*	----
Buffers	----	• Large buffers of >1 km are provided and available.	----
Landform	----	• Activities are designed and located behind the natural ridges, where possible by excavating from the base of the pit. • The separation distances mitigate the dust risk to the residences from excavation and processing. • Transport dust risks pose the greatest offsite risk. Murray Road has been progressively upgraded by the Shire of Esperance.	----
	----	• The pit is worked from the floor where possible to reduce wind on the floor and to enable the face to provide barriers to dust lift off and carry.	----
Vegetation	----	• Vegetated buffers of 1000 metres are in place.	----
Pit Design and Staging	----	• Design and staging have been selected to maximise dust management.	----
Screening	----	• The buffer distance are large enough for tree belts not to be required for quarrying and processing. • Operating on the floor of the pit reduces wind speed and lessens the risk of dust lift off.	----
MANAGEMENT			
Occupation	----	• Air conditioning and enclosed cabs used for on site operational mobile plant.	----
Monitoring	----	• A monitoring system is in place. See Trigger Conditions below.	----
Trigger conditions	----	• Most dust is generated from vehicle movements and uncontrolled crushing. • The trigger for dust management is the generation of visual dust. • The site supervisor is normally the loader driver who is in the best position to assess dust generation and to direct remediation. • On site operators are instructed to visually monitor dust, report and treat any visible dust.	----
Adverse weather	Moderate - Uncommon in winter, more common in	• When winds are sufficiently strong, or other weather conditions are unacceptable to negate the effects of dust management, operations will cease until conditions improve and compliance can be achieved.	Low

	summer.		
Equipment failure	Low to moderate - Uncommon	• Machines and site activities are shut down in the event of breakdowns that prevent adequate dust management.	Low
Training	----	• The proponent will use on site induction and training to all personnel at all operations.	----
Complaints	----	• A record of all dust complaints is to be maintained together with the mitigation measures to be used to reduce the dust impacts. • All complaints relating to dust are to be investigated immediately on receipt of a complaint. • As far as is known there have been no complaints within the past ten years	----
EARTHWORKS			
Land Clearing	Moderate - Once per year	• The only significant clearing will be for the propsosed pit.	Low
Overburden removal	Moderate - Once per year	• Subgrade material will not be excavated or disturbed where possible.	Low
Land restoration	Moderate - Once or twice per year	• Land restoration will progressively follow excavation and will mainly consist of the floor being left in an undulating excavated state ready for planting.	Low
EXCAVATION - PROCESSING			
Excavation	High - Frequent	• A loader or excavator will extract material from the face and load directly to road trucks. • A bulldozer may be used from time to time. • A small crusher and screen is normally required for calcified and lithified materials.	Low
Processing	High - Frequent	• Hardstand surfaces are maintained in good condition (free of potholes, rills and product spillages) and with suitable grades. • Plant location, and transport approaches with respect to wind directions, will be used to minimise impact on operators. • Mobile crushing and screening plant will be located on the pit floor below natural ground level to reduce wind speed and reduce dust lift off. Crushing or screening plant will be licensed through the DER as required.	Low
Stockpiles	Moderate - Moderate	• Stockpiles will only be required where crushing and/or screening is use and will be located on the floor of the pit at generally low elevations. • It is the vehicle movements during dry conditions that generate the greatest dust risk.	Low
		• Plant location, and approaches with respect to wind directions, will be used to minimise impact on operators. • The internal roads are graded as required to minimise dust.	Low
TRANSPORT			
Access Road	Moderate to High - Frequent	• The access road will be no different to the existing facilities and access. • The access road is to be maintained in good condition (free of potholes, rills and product spillages). • Water or soil stabiliser will be used to wet down the access road as required.	Low
Loading and Road Transport	Moderate to High - Frequent	• Trucks are required to install tarpaulins or cover prior to exiting the quarry. • Transport and operations are anticipated to be intermittent through the year rather than continuous.	Low
		• A site code and induction system is used for the quarry.	

		• Road trucks are required to be maintained in a clean condition. Loader drivers are instructed on the best means of loading to minimise overflow and spillage. • Trucks are inspected prior to leaving the site and brushed down as necessary. • A policy of instructing drivers to report and clean up spillages will be provided.	
		• This forms part of Triple M normal operational procedures. • Loader drivers are instructed on the best means of loading to minimise overflow and spillage. • Trucks are inspected prior to leaving the site and brushed down as necessary.	

5.4.7 Dust Monitoring

The most effective dust monitoring is the sighting of visible dust. Dust can be detected as soon as it leaves the wheels of vehicles and detection is not reliant on dust travelling to a machine monitor located near the boundary. This is what has been successfully used in the past and will be applied to the existing and proposed quarries.

When trigger conditions are detected and/or alerted, relevant action is taken. This can include additional water suppression, modification of procedure, delay until more favourable conditions are present, use of alternative equipment etc.

Human monitoring can detect potential dust risks prior, and take action prior, to significant dust being generated. They notice dust immediately such as from tyres, whereas machine monitoring has to rely on significant dust being generated, travelling to the boundaries of the premises and triggering an alarm. The operators would be negligent if they let the dust get to that level of impact prior to taking action.

The auditable condition is visible dust crossing the boundary of the premises; the lot boundary. This is the condition used on Department of Environment Regulation Licences for all other quarries such as sand, limestone and hard rock quarries in Western Australia and has worked well in the past.

It is also the method used by the Department of Mines and Petroleum to rapidly assess occupational dust on site.

Most dust generated from processing and vehicle movements has a very large visible component. Lesser risks emanate from excavation and land clearing. As invisible dust can be generated with the visible dust, recognising and dealing with visible dust is a very effective instantaneous method of recognising excessive dust.

The quarry manager and leading hand are ultimately responsible for site supervision of dust. They will travel around the operations and pit frequently and are in two way radio contact with all mobile plant.

All operators on site are to be instructed to be vigilant to dust generation and management and report any excessive dust or potential dust management issues.

Visual monitoring is even more effective when complemented by an extensive reporting and complaints process and this is used and is proposed.

5.4.8 Greenhouse Gas

Over the years trucks have become more efficient with respect to greenhouse gas emissions, particularly with the use of truck and trailer and road train configurations.

The proponent will seek ways to reduce the amount of fossil fuels used, and has obtained more efficient mobile plant and equipment when this has become economically available.

The internal design of the operations will minimise the haulage route to save energy use and potential impacts.

The location of this pit means that it is closer to some parts of the Wheatbelt which provides for savings in fuel to get the limesand to the agricultural areas.

5.4.9 Complaints Procedure

Visual monitoring is more effective when complemented by an extensive reporting and complaints process.

An effective complaints mechanism is an essential part of the dust identification and management and is proposed.

A complaints book that lists the items below will be used. The book will be available as requested.

- The complaint,
- Nature of the complaint, time and date,
- Source of the complaint,
- Investigations of the complaint,
- Results of the investigation,
- If the complaint is valid, any mitigation actions that result,
- Any communication with the complainant.

Dust Management - Applicable Legislation / Policies
• *Guidance for the Assessment of Environmental Factors, EPA, March 2000.* • *Land development sites and impacts on air quality, DEP, 1996.* • Department of Environmental Protection Guidelines, November 1996 and *DEC 2008, A guideline for the development and implementation of a dust management plan*
Commitments to Dust Management
• The proponent will take the necessary steps to manage and contain dust by implementing and maintaining the Dust Management Plan.

5.5 Water Quality

Limestone excavation is a clean operation similar to sand excavation in the nature of the risk to groundwater. No chemicals are used apart from normal lubricants, which is similar to sand excavation, and sand excavation is one of the few industries that are permitted to operate in a Priority 1 Public Drinking Water Source Area, indicating the clean nature of the activity. See Department of Water *Land Use Compatibility in Public Drinking Water Source Areas.*

Limestone excavation does not affect the quality of water in the shallow ground water system because the only chemicals used are normal fuels and lubricants; a fact that is recognised by the Department of Environment Regulation who permit extractive industries in Priority Groundwater areas such as Lake Gnangara where sand excavation occurs within 3 metres of the water table.

The protection of water, whether groundwater or surface water, is an important part of the management of quarries.

The main Environmental Objective relating to water management is;

- Minimise the impact on surface and ground water quality.

Groundwater flow is deep and to the ocean under the pit and interpreted to be most likely also to the south to the ocean under the stockpile.

The base of the excavation will be over 40 metres to the water table.

Potable water will be brought in from scheme supply.

The management actions are considered in the attached Water Management Plan.

The proposal is consistent with all Government Policies for extraction of limestone and sand and complies with the same requirements for extracting in Priority Drinking Water Source Protection Area.

Water Management - Applicable Legislation / Policies

DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing

- *Overview*
- *Minesite water quality monitoring*
- *Minesite stormwater*
- *Mechanical servicing and workshop facilities*
- *Mine dewatering*
- *Health Act 1911*

Commitments to Water Management

- The site complies with Department of Water Guidelines for separation to groundwater.
- The nature of the operation and the depth to groundwater will minimise any risk to groundwater systems and Lake Pollard.
- Management procedures outlined above are committed to, to protect water quality.
- There will be no alteration to surface water flows or groundwater levels.
- The proponent will have in place a site code outlining requirements for operators and drivers.
- The proponent will conduct training programs on pollution minimisation practices.

5.6 Biodiversity Management

5.6.1 Vegetation and Flora

Flora

The vegetation was assessed by the Esperance Wildflower Society in 2000. Since that time the vegetation as been reviewed by Lindsay Stephens of Landform Research but no further study has been able to be completed because the vegetation has been burnt in recent years.

The flora and vegetation is attached as Attachment 1. An additional study closer to the coast was conducted in 2009 which, although outside the area, provides some additional information.

The vegetation is listed as dense Low Coastal Heath typified by *Acacia Cyclops, A. cochlearis* and *A. rostellifera* over *Spyriduium globulosum, Hibbertia racemosa, Melaleuca pentagona, M. pulchella* and *Leucopogon parviflorus*.

The vegetation is typical of the coastal vegetation around much of the south coast. See Attachment 1

The vegetation is classified by Beard 1973, DEC (DER 2012, as;

eaSi, Coastal dune scrub. This equates to Beard Association 42.

There is no *Banksia* Scrub or Proteaceous shrubland or woodlands on the proposed excavation area.

Vegetation on Site

Species List

The vegetation was assessed by the Esperance Wildflower Society in 2000 and 2009. These studies are attached.

The vegetation is listed as dense Low Coastal Heath typified by *Acacia Cyclops, A. cochlearis* and *A. rostellifera* over *Spyriduium globulosum, Hibbertia racemosa, Melaleuca pentagona, M. pulchella* and *Leucopogon parviflorus*.

On the excavation site there are two main vegetation types.

Low Coastal Heath, dominated by the coastal species with reduced proportion of *Acacia* and stunted *Acacia Cyclops* and *Acacia rostellifera*.

In October 2016 the resource area was again reviewed and even though it had been burnt the vegetation was still confirmed as the coastal vegetation types with the species observed by Lindsay Stephens of Landform Research as Coastal vegetation regrowth. Even though the burnt vegetation made identification difficult the following species were observed; and typified by;

Phyllanthus calycinus, Acacia cyclops, Desmocladus flexuosus, Spyridium globulosum, Acacia cochlearis, Muehlenbeckia adpressa, Lepidosperma squamatum?, Melaleuca pulchella, Calothamnus quadrifidus, Anthocercis littorea, Velleia trinervis, Austrostipa flavescens?, Scaevola crassifolia, Goodenia tripartitia

In the more protected swales the proportion and influence of the *Acacia Cyclops* and *Acacia rostellifera* increase to provide a coastal vegetation towards *Acacia* Thicket. The proportion of *Acacia* also relates to fire succession and frequency.

See Attachment 1.

Threatened and Priority Species

No plant species or taxa are listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. Attachment 1.

Threatened or Priority Ecological Communities

No Declared Threatened, Priority Species, Significant flora or Threatened or significant ecological communities were identified during the vegetation assessment conducted by the Esperance Wildflower Society.

The Proteaceous dominated vegetation, ***Proteaceae dominated kwongkan shrublands of the south east coastal floristisc provence of Western Australia***, is listed as Threatened under the *EPBC Act 1999*. A Conservation Advice is provided for that plant community and includes extensive species lists. The species lists provided are not typical of those found on Lot 502 which on the resource area is coastal heath.

The ***Scrub heath on deep sand with Banksia and Lambertia, and Banksia scrub heath on Esperance Sandplain*** is listed as Priority 3 Community on State Conservation Lists.

The vegetation on the resource area is not representative of these communities.

See Attachment 1.

Vegetation Representation

The vegetation is listed as Beard Association 42, Shrublands mallee and *Acacia* scrub on south coastal dunes. This is also concluded by DEC (DER) 2012 in the Vegetation Clearing Assessment Report for the existing quarry.

Shepherd et al 2002, Native Vegetation in Western Australia Extent, Type and Status, Department of Agriculture and Food Resource Management Technical Report 249 lists Vegetation Association 42 as having;

> Pre-European extent of 370 327 hectares of which 357 275 hectares remains. This represents 96.5% of the original extent.
>
> Of the remaining vegetation 46.8% is located within IUCN Class I – IV Reserves, 0.0% is located within other Reserves and 0.0% is located within pastoral leases managed by DPAW.

The large areas of vegetation linkages that remain, and will be re-established at the end of mining, can be seen in the figures included in the main report. The success of the rehabilitation to date can be seen in the following photographs.

5.6.2 Vegetation Clearing

*Clearing is controlled under the **Environmental Protection (Clearing of Native Vegetation) Regulations 2004.** These regulations provide for a number of principles against which clearing is assessed.*

A separate Flora and Vegetation Assessment and Report is included in Attachment 1.

The procedures used for vegetation clearing are documented in 5.9.2 Rehabilitation. These were used and are included here in case a small area of additional clearing is applied for to the immediate north of the existing permited area.

Topsoil and overburden treatment is covered in 5.9 Rehabilitation. All suitable materials will be retained for rehabilitation and directly transferred where possible.

A current Clearing Permit is in place for the existing excvation. (CPS 4782/1) and a new permit will be applied to cover the proposed extraction area.

5.6.3 Fauna

A fauna study was not conducted because the resource area represents a very small area within a large area of remnant vegetation with a small area only open at any one time.

The nearby vegetation of similar communities is in excellent condition over large areas. The small area of proposed disturbances and the large connectivity remianing in place will not cause any isolation of short range fauna.

With the small area proposed to be open at any one time, a return to local native habitat, the proven rehabilitation methods and the benefits of the predator proof fence, the impacts on fauna are not considered significant.

No matters of significance under the *EPBC Act 1999* were identified. The potential impact on feeding habitat of Black Cockatoos is almost nil because the only food source of Proteaceae is very limited to non existent in most areas. With the staging and small footprints the proposed activities will not trigger referral to the Commonwealth.

Rehabilitation has been very successful at the current pit.

5.6.4 Wetlands

The site lies approximately 40 km west from Esperance at the end of Murray's Road on the eastern side of Lake Quallilup, 300 metres from the lake and 500 metres from the closest portion of coast.

Ther has been no impact on the lake from the current excavation and the proposed excavations are further away to the east.

Biodiversity - Applicable Legislation / Policies
• None applicable – Likely to be conditioned
Commitments to Biodiversity Management
• The excavation areas are selected and the operations designed to minimise impacts on Biodiversity. • Biodiversity impacts will be very small and temporary as the land excavation will be staged and rehabilitated as soon as possible.

5.6.5 Dieback Management Plan

Dieback of vegetation is often attributed to *Phytophthora cinamomi* even though there are other *Phytophthora* species and other diseases such as *Armillaria* that can cause dieback like symptoms. Microscopic soil-borne fungi of the genus *Phytophthora* kill a wide range of native plants and can cause severe damage to many vegetation types, particularly those from the families Proteaceae, Epacridaceae, Xanthorrhoeaceae and Myrtaceae.

In most cases dieback is caused by a pathogen which infests the plant and causes it to lose vigour, with leaves dying, and overtime may kill the plant. As such the management of Dieback is essentially related to plant hygiene when coming onto a site and within a site.

Examination of the vegetation does not suggest the presence of dieback which on calcareous soils such as this is in line with other findings.

There are several guides to the management of Dieback.

- Department of Environment and Conservation (DPaW) Dieback Hygiene Manual 1992 is a practical guide to Dieback management.
- Department of Environment and Conservation (DPaW) Best Practice Guidelines for the Management of Phytophthora cinamomi, draft 2004.
- Dieback Working Group 2005, Management of Phytophthora Dieback in Extractive Industries.

The Department of Environment Regulation generally recognises that Dieback is less likely to impact on vegetation on limestone and Spearwood/Cottesloe Land Systems, Podger F D and K R Vear, 1998, *Management of Phytophthora and disease caused by it, IN Phytophthora cinnamomi and the disease caused by it - protocol for identifying protectable areas and their priority for management*, EPA 2000. The same is noted in DEC 2009.

Dieback is only likely to be an issue when equipment is brought to the site from a dieback affected area either through vehicles or plant and soil materials, therefore the following general principles are applied to Dieback management.

Even though there is no evidence of infestations strict hygiene measures will be used.

Not all potential impacts will apply to all parts of the proposed quarry operations. E

- Excavation will be undertaken using practices recommended by DEC. See *CALM Dieback Hygiene Manual 1992* which is more practical and *CALM Best Practice Guidelines for the Management of Phytophthora cinamomi, draft 2004.* See also *Dieback Working Group 2005, Management of Phytophthora Dieback in Extractive Industries.*
- Dieback diseases are more likely to be transported under moist soil conditions.
- All vehicles and equipment to be used during land clearing or land reinstatement, should be clean and free from soil or plant material when arriving at site.
- The site will effectively be a spit system with road traffic restricted to the stockpile loading area. Road trucks only access the processing area and will not go into the active pit.
- Washdown of vehicles and equipment should be completed prior to arriving on site and to the procedures in DER Guidelines for Dieback Management.
- Trucks that have been used to transport grain should be swept out and cleaned in an agricultural area prior to arriving at site to minimise the risk of cereal seeds being introduced.
- No soil and vegetation should be brought to the site apart from that to be used in rehabilitation.
- Plants to be used in rehabilitation should be from dieback free sources.

- Vegetated areas ahead of excavation should be quarantined to onsite access
- Unwanted access to vegetated areas is to be discouraged through a lack of tracks and external fencing.
- Excavation vehicles will be restricted to the excavation area apart from clearing land.
- Rehabilitated surfaces are to be free draining and not contain wet or waterlogged conditions.
- Illegally dumped rubbish is to be removed promptly**.**
- No contaminated or suspect soil or plant material is to be brought onto the site.
- When clearing land or firebreaks vehicles are to work from dieback free areas towards dieback areas; or, in situations where dieback interpretation is not possible, from areas of higher quality vegetation to areas of lower quality vegetation.
- Roads should be free draining and hard surfaced.
- A hygienic site is to be maintained by not bringing any soil or plant material onto the site except for rehabilitation purposes or from known dieback free areas.
- All plants, seeds and other materials used in rehabilitation will be sourced from dieback free areas.
- The predator proof fence and gate system will be maintained.
- Compliance with the Weed Management Policy.

Dieback principles will be followed even though there is a reduced risk of spread on calcareous soils such as this. (Podger F D and K R Vear, 1998).

The proposed access road will be limestone road.

The aim of dieback management during excavation is to minimise the risk of entry of dieback into the site. The calcareous soils of the remnant vegetation are unlikely to allow *Phytophthora* to spread but there may be other pathogens such as *Armillaria.*

In many ways the management of the site for dieback is similar to that for the management of weeds, and the two management practices should be considered together.

The other management is to ensure that all excavation equipment and road transport vehicles are clean and free from soil and vegetable matter prior to entering the operations.

Vehicles are to be prohibited from entering vegetation ahead of excavation, apart from normal travel along made firebreaks and roads for normal security and farm maintenance activities.

Topsoil will be cleared according to 5.9.2 Rehabilitation Procedures.

Dieback - Applicable Legislation / Policies

- *DEC (DPaW) Dieback Hygiene Manual 1992.*
- *DEC (DPaW) Best Practice Guidelines for the Management of Phytophthora cinamomi, draft 2004.*
- Dieback Working Group 2005, *Management of Phytophthora Dieback in Extractive Industries.*

Commitments to Dieback Management

- The proponent will not impact on the adjoining remnant vegetation by the proposed excavation.
- The proponent will maintain the Dieback Management Policy to reduce the spread of Plant Pathogens.

5.6.6 Weed Management Plan

The management of weeds is essentially similar to that for plant diseases. The impact of weeds is really the impact within the local area and the more they are controlled the better. It is desirable that the site does not become a haven for environmental weeds and therefore a management and control program is warranted at all sites.

Weeds can be declared under the *Agriculture and Related Resources Protection Act 1976* which requires that Declared Weeds are eradicated. Other weeds are not Declared but may be classified as Environmental Weeds because they are well known for impacting on vegetation.

Generally if the actions taken for Dieback are applied they will also control weeds.

During the site inspections by Landform Research, most of the vegetation is weed free, although there are some cereal and crop weeds present on the eastern side of the access road, possibly from past farming activities or sweeping out of some trucks prior to loading with limestone.

A total of 41 species were recorded during the site investigation for the existing pit in 2000 which is relevant to the proposed excavation, with an additional two exotic species. See the survey in Attachment 1.

As noted above only two Proteaceae species were identified, *Grevillea pauciflora* and *Hakea nitida.*

The 2008 - 2009 survey, which went well beyond the excavation area, identified 75 species of which 8 were identified as weed species.

Therefore weed management practices will be used.

- All vehicles and equipment to be used during land clearing or land reinstatement, will be clean and free from soil or plant material when arriving at site.
- No soil and vegetation will be brought to the site apart from that to be used in rehabilitation.
- Trucks that have been used to transport grain should be swept out and cleaned in an agricultural area prior to arriving at site to minimise the risk of cereal seeds being introduced.
- Plants to be used in rehabilitation will be free from weeds.
- Vegetated areas ahead of excavation will be quarantined to excavation vehicles until required.
- Unwanted access to vegetated areas is to be discouraged through a lack of tracks and external fencing.
- Weed affected top soils may need to be taken offsite, used in weed affected areas, buried by 500 mm soil/overburden or taken offsite or sprayed to minimise the weed impact.
- Illegally dumped rubbish is the major source of weeds and is to be removed promptly.
- No weed contaminated or suspect soil or plant material is to be brought onto the site.
- When clearing land or firebreaks vehicles are to work in conjunction with dieback principles and push from areas of better vegetation towards areas of lower quality vegetation.
- Weeds should be sprayed with broad spectrum spray prior to planting or seeding in weed affected soils.
- Unwanted grasses should be sprayed with grass selective spray prior to seeding or rehabilitation.
- Weed management should work from least affected areas to most affected.

- Declared weeds should be treated promptly by digging out or spraying.
- Weeds will be treated promptly no matter how few there are.
- The predator proof fence and gate system will be maintained.
- Ongoing monitoring of weeds should be undertaken at least annually in autumn, prior to winter rains.

The Dieback Management actions will also be used to assist weed management.

Inspections should be conducted to monitor the presence and introduction of weeds on an annual or more frequent basis. On identification, introduced weeds will either be removed, buried, or sprayed with a herbicide.

Weed - Applicable Legislation / Policies
• *Agriculture and Related Resources Protection Act 1976.*
Commitments to Weed Management
• The proponent will use the weed policy to try and prevent the introduction of Declared, Environmental or other weeds to the site.

5.7 Fire Protection

Fire risk is normally controlled through the *Bush Fires Act 1954* and local authority bylaws.

The excavation area will form a natural firebreak; the access road will also assist. Water available on site can be used for fire fighting.

The safety of workers is managed through a Safety Management Plan developed through *the Mines Safety and Inspection Act 1994 and Regulations 1995*.

There are a number of management actions that can be taken in quarries to minimise fire risk and these will be used wherever possible. The general management actions are summarised below, together with the potential issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise fire risk.

- Restrict vehicles to the operational area, particularly on high fire risk days.
- Shut down operations when vehicle bans are in place from the local authority FESA or Department of Parks and Wildlife.
- Use diesel rather than petrol powered vehicles.
- Maintain perimeter fire breaks as required.
- Ensure fire risk is addressed and maintained through the site Safety Management Procedures.
- Provide an emergency muster area, communications and worker induction and training.
- Establish on site water supplies for potential use in extinguishing fire.
- Secure the site from unauthorised access.
- Maintain normal farm fire breaks and fire prevention procedures.

There is less potential fire risk from quarries than other land uses because quarries clear land, and vehicles are restricted to cleared access roads, the pit floor, processing and stockpile areas.

These cleared areas form a natural firebreak. The main risk comes from an external fire in the surrounding vegetation, impacting on the quarry. As such the fire risk is no greater than a rural property.

If there is a fire the site will be evacuated. If vehicles or plant are left on site, they will be parked in the centre of the pit in line with normal minsite actions.

Fire Management - Applicable Legislation / Policies
• *Bush Fires Act 1954.* • *City of Albany Bylaws.*
Commitments to Fire Management
• The proponent will ensure the quarry operates to the standards in the *Mines Safety and Inspection Act 1994 and Regulations 1995.* • The proponent will ensure the quarry complies with the local fire safety requirements and operates in compliance with normal rural fire practise and restrictions.

5.8 Aboriginal Heritage

A search of the Department of Aboriginal Affairs database reveals that there are no recorded sites.

Aboriginal Sites
• *Aboriginal Heritage Act 1972-1980*
Commitments to Aboriginal Heritage Management
• Should any evidence of early aboriginal occupation be uncovered during the operation of the quarry, development will be stopped pending an assessment by a recognised consultant. • If the site is confirmed as a site under the provisions of Section 15 of the Aboriginal Heritage Act 1972-1980 and Amendments, the proponent will comply with the provisions of the Act, relating to development in areas of recognised aboriginal sites.

5.9 Rehabilitation

5.9.1 Background

The area is currently remnant coastal heathland vegetation partially disturbed by tracks, a previous small excavation that has been rehabilitated, drill pads and soil test holes.

The existing limestone pit that has been partially rehabilitated demonstrates that the retention and direct spread of topsoil can provide fast and good rehabilitaiton of local native species and communities.

It also demonstrates that excavation can be completed with reduce impacts as there is an absence of weeds and dieback diseases in the previoulsy excavated and disturbed areas. The best means of revegetation is to use;

- Vegetation and topsoil recovered from clearing.
- Brush cut from adjoining vegetation.

The use of additional seed collection and seeding remains a contingency, but based on existing rehabilitation is not considered necessary.

The species to be chosen and the planting densities should match pre-excavation vegetation, adjoining vegetation, soil conditions and function of each site. For example when revegetating land within a National Park or Reserve a higher level of species richness and plant density might be expected than on a visual screening bund.

The species will therefore need to be selected to match the local plant communities or a restricted number of fast growing species may be used. The species to be used in rehabilitation may be different to that which originally occurred on site, because the land surface might be much lower and have higher levels of soil moisture or the soil conditions may be different.

Rehabilitation should contain Dieback and Weed Management in addition to monitoring and replanting failed areas. There should also be a completion criteria against which the revegetation should be compared.

- **End Use**

The extraction of limestone is seen as an interim use of the land prior to utilisation of the area by the current land holder.

The final contours are anticipated to be undulating up to 15 metres below the existing land surface replicating other portions of the limestone ridge.

The end use will be a return to local native vegetation.

- **Mine Closure Considerations**

Rehabilitation will be directed towards the final end land use of native vegetation, and is to be aimed at the highest level of rehabilitation.

Rehabilitation will contain Dieback and Weed Management in addition to monitoring and replanting failed areas.

Appropriate vegetation clearing and reuse combined with topsoil management is seen to be an important element in achieving successful rehabilitation and plant re-establishment on the restored surface.

The following procedures have been selected from observation of the existing operations and experience in the rehabilitation of the old limestone pit and other limestone quarries by worked on by Landform Research.

- **Rehabilitation Objectives**

It is the experience of Landform Research that whilst seed collection of local plants is possible it is much more productive to manage the topsoil and then respread it correctly.

The best source of seeds is the top 3 cm of the soil, leaf litter and vegetation cleared. The seeds of species such as *Melaleuca, Kunzea* other shrubby species are held on the stems, and when respread, provide a seed source. This is the same source that would be collected on site.

It is very difficult to collect seeds of small species such as *Conostylis, Patersonia, Lomandra* and other such species. The seeds of these species are quickly dropped.

A great deal of time can be spent trying to collect these seeds when they are present in significant numbers within the topsoil and leaf litter. By wise use and management of the topsoil and leaf litter, as proposed, the local seed base is used. Seed collection is undertaken where it will be productive, such as brushing slopes.

Appropriate topsoil management is seen to be an important element in achieving successful rehabilitation and plant re-establishment on the restored surface.

The best rehabilitation is to use a 4 pronged approach as listed in the management plan,

- Best Practise topsoil and leaf litter management and respreading.
- Respreading crushed vegetation matter.
- If required, the use of seeding or tube plants from local provenance particularly of the Proteaceae as these can be reduced from topsoil use alone.
- If required the use of local provenance seed treated with smoke.

The *Draft Guidelines for Mine Closure Plan 2010* prepared by the EPA and DMP recognise the direct return of topsoil as the best method of returning local native species combined with other methods

The end use of the land is proposed to be a return to local native vegetation.

Rehabilitation will utilise best practice and be directed towards achieving a sustainable cover of local native vegetation that is capable of forming a similar species richness and diversity to the vegetation that was previously cleared.

1. All plant, foreign materials, buildings and other matter associated with mining will be removed from site.

2. The disturbed land will be made safe and in compliance with the *Mines Safety and Inspection Act 1994* and DMP *Mine Closure Guidelines*.

3. All legally binding conditions and commitments relevant to mine closure and rehabilitation will be met.

4. The land surface will be resistant to wind and water erosion.

5. Rehabilitation vegetation will be a sustainable cover of local native vegetation that is capable of forming a similar species richness and diversity to the pre-mined vegetation.

6. Revegetation will be free from Declared or Environmental weeds that could compromise the success of the revegetation or spread into adjoining native vegetation.

7. The rehabilitated vegetation will have similar resilience to the local vegetation.

8. Soil properties will be appropriate to sustaining revegetated local native species.

9. Rehabilitated areas will form a sustainable habitat that will be capable of improving with time as vegetation growth continues. Specific fauna habitat will be used, such as logs, uneven land surface, rocks and recovered vegetation to provide a habitat suitable for local native fauna.

- **Completion criteria – Interim Final Landuse**

The aim of the rehabilitation is to provide an ecologically stable community as close as possible to the original native vegetation of the Quallilup area.

- Achievement of an ecologically diverse and stable vegetation community, which requires minimal long-term management and maintenance on land not required for future activities.

  Establishment of vegetation of local native species that has similar ecological values to the native vegetation and is capable of providing similar species richness and plant density. The ultimate aim is to achieve 1 stem/m^2, but an interim completion criteria of 2000 plants per hectare will be used with the plant density gradually improving over time.

- Stable post-mining landscape, and the minimisation of wind or water erosion.

- Create an environment that encourages re-colonisation by a diverse range of fauna species on land not required for future activities.

- Provide for the protection of the local groundwater resource in terms of both quality and quantity.

- Provide a self sustaining cover of local native groundcovers, shrubs and trees on land not required for future activities.

- Achieve weed species at levels not likely to threaten the native species.

Depending on the success of rehabilitation, evolving community standards, and new research, the completion criteria may be adjusted to reflect emerging trends and also adjusted in terms of cover and species richness

5.9.2 Rehabilitation Procedures

Vegetation Clearing – Recovery

1. A Clearing Permit will be required for areas of native vegetation to be cleared under *Section 46 of the Environmental Protection Act 1984.*

2. Dieback and weed management will be undertaken as outlined in the attached Dieback and Weed Management Plans.

3. The footprint will be marked on the ground by flagging and survey tape in the same manner as all developments. The loader - bulldozer will then push to that marked line.

4. Vegetation clearing will be progressive and minimised to that required for each stage of excavation.

5. Seeds and other genetic material will be collected if suitable areas are available for rehabilitation and would enable the preservation of genetic material, such as on batter slopes and in green belts.

6. Where practicable vegetation will be directly transferred to a batter slope being rehabilitated. Smaller indigenous shrub material will be used in the rehabilitation process when available and suitable, for example on the batter slopes of worked out areas. It will be laid on re-formed slopes to reduce wind and water erosion as well as provide a source of seeds for revegetation.

7. Smaller vegetation will be track crushed and directly transferred to areas under rehabilitation to assist soil and habitat generation. The vegetation contains a significant seed source, because of the contained seed on many species, it is also a source of microbial material for soil formation, adds to habitat and assists in managing wind erosion.

8. The vegetation will also be used on the batters to minimise soil erosion and spreading on the final land surface as part of the final rehabilitation.

9. If direct transfer is not possible the vegetation will be stored in low dumps to 1 metre high or swapped with a nearby operator to try and ensure that the material is not wasted.

Topsoil Recovery and Use

10. Essentially all topsoil, vegetation fragments and any overburden will be recovered from cleared areas and retained for use in rehabilitation. The vegetation will be stored with the topsoil in low dumps <1 metre high around the perimeter of the pit.

11. Topsoil clearing will be progressive and minimised to that required for each stage of excavation.

12. Topsoil will be pushed to one side and formed into low storage dumps for later use for rehabilitation using either a loader or bulldozer.

13. Overburden, as yellow and brown sand and low grade limestone, will then be pushed to the perimeters, normally by bulldozer, to form bunding around the active area.

Figure 7 Rehabilitation at the existing pit

Figure 8 Rehabilitation at the existing pit

- **Landform Reconstruction and Contouring**

1. Land restoration and rehabilitation of any completed areas will be conducted prior to the site being vacated following the yearly excavation campaign at the end of autumn which is an appropriate time for rehabilitation.

2. All buildings, equipment and machinery will be removed from site at the end of activities.

3. All inert materials associated with processing will either be buried or removed from site. All non inert materials will be removed.

4. Limestone roadbase and hard stand will either be removed from site to an approved disposal situation or buried by 0.5 metres plus of limestone overburden and soil.

5. Any hardstand and roadbase areas will be deep ripped using a tyne attached to a loader, grader or bulldozer.

6. The land surface will be formed to the requirements of the *Mines Safety and Inspection Act 1994 and Regulations 1995* as a final land surface. The faces will be battered at 1 : 3 to 1 : 5 vertical to horizontal.

7. As the limestone is porous there will be no need for upslope contour or diversion banks to prevent water entering the void. Similarly there will be no need for drainage works on the floor of the void.

8. Limestone floor will be deep ripped in two directions where it is compacted. The width between rip lines will be 1 – 2 metre intervals.

9. A minimum of 300 mm of overburden will be spread over the surface where available to provide a substrate for revegetation. On limestone, rehabilitation can be very successful with minimum overburden when the floor is adequately deep ripped.

10. Experience by Landform Research on limestone rehabilitation on mining leases is that good revegetation can be achieved by planting into soft overburden and deep ripped limestone floor, if suitable local species are used.

11. The land surface will be formed to be geotechnically stable to the requirements of the *Mines Safety and Inspection Act 1994 and Regulations 1995* as a final land surface.

12. The final land surface will be smoothed to be compatible with the existing natural landform of the area with some slopes left potentially at the angle of natural repose for limesand to replicate the natural dune system.

13. As the limestone is porous there will be no need for upslope contour or diversion banks to prevent water entering the void. Similarly there will be no need for drainage works on the floor of the void. The floor will be formed to drain to low points to manage storm events.

14. Where possible any disturbed areas that are no longer required will be rehabilitated using the methods described above within 12 months of becoming available.

Pre - Vegetation Establishment

1. Pre-seeding weed control is only likely to be required where topsoils are used that contain weed species.

2. If required this is normally only conducted after overburden and topsoil have been spread and any seeds have been allowed to germinate. Broadscale weed treatment can be detrimental to the germination and growth of native and some pasture species but may be required if the weed load is to be reduced.

3. Any weeds likely to significantly impact on the rehabilitation will be sprayed with Roundup or similar herbicide or grubbed out, depending on the species involved. Weed affected topsoil and overburden will be buried. The Weed Management Plan will form the basis of weed treatment. Depending on the nature of the planting substrate, a broad spectrum spraying program may be used. In areas where grass only is a potential problem grass specific sprays will be used. In some areas where topsoil from cleared native vegetation is available no spraying may be required.

- **Revegetation**

Pre-seeding weed control is only likely to be required where topsoils are used that contain weed species such as in the north east of the site.

If required this is normally only conducted after overburden and topsoil have been spread and any seeds have been allowed to germinate. Broadscale weed treatment can be detrimental to the germination and growth of native species but may be required if the weed load is to be reduced.

In May, after the first autumn rains, check for grass germination. Where grass has the potential to inhibit rehabilitation use a licensed contractor to spray with Fusillade or other suitable herbicide.

1. Any weeds likely to significantly impact on the rehabilitation will be sprayed with Roundup or similar herbicide or grubbed out, depending on the species involved. Weed affected topsoil and overburden will be buried. The Weed Management will form the basis of weed treatment. Depending on the nature of the planting substrate, a broad spectrum spraying program may be used. In areas where grass only is a potential problem grass specific sprays will be used. In some areas where topsoil from cleared native vegetation is available no spraying may be required.

2. Triple M Transport will spread any vegetation, plus leaf, root and organic matter collected from the land clearing procedures. This will increase the total organic carbon fraction, improving soil properties such as resistance to water and wind erosion and moisture retention. The difference in properties between existing topsoil and subsoils is not considered a major impediment to rehabilitation of native species in the area.

3. Topsoil will be re-distributed in rehabilitated areas to depths of 50 mm where available. Whilst burning is not always practicable or permitted the mixing of topsoil with ash and charcoal from burnt vegetation has shown a demonstrated improvement in the germination of local native species by triggering some species that do not normally germinate and by increasing germination rates. (Landform Research at Pickering Brook Gravel Quarry). At this stage burning of vegetation is not proposed.

4. Topsoil provides a useful source of seed for rehabilitation of Limestone Heathlands, when the correct handling of the topsoil is used, stripped and replaced dry (autumn direct return). Maximum depth of 50 mm can be used to optimise revegetation of species-rich plant communities.

5. Studies have shown that topsoil stripping and placement is best undertaken in summer for maximum germination, but this raises the potential for additional dust generation from the fine humus particles.

6. Topsoil will be spread directly from an area being cleared where possible, otherwise reclaimed from a topsoil dump.

7. Topsoil will be spread during summer, preferably by the end of February where possible to take the opportunity for autumn revegetation.

8. Rehabilitation will take place during the first winter months following the restoration earth works of each particular section of quarry. Leaving the completed earth works for one season will reduce the success of rehabilitation by at least 50%, due to compaction effects.

9. Local provenance seed will be collected from the site or purchased from commercial seed collectors. Tube plants are also desirable because they reduce the risk of failure by providing a third method of establishment;

    - topsoil spreading
    - seed spreading (if necessary)
    - tube plants (if necessary)

10. A species list is attached in the studies conducted by the Esperance Wildflower Society.

11. A combination of the three methods is always preferred by Triple M Transport and Landform Research and has proven to be the most versatile and successful. The amount and species of additional seed and tube stock depends on the quality and seed store within the topsoil, and may vary from stage to stage.

12. Seeds of indigenous species, if used, where there is insufficient topsoil, will be scattered during late summer at the rate of approximately 1 - 2 kg seeds per hectare if required.

13. Seeding conducted in summer will use scarified leguminous seeds that have been “dry smoked”. Seeding conducted in July to August will have the leguminous seeds heat treated and all seeds will be smoke treated by soaking in “smoke water” for 24 hours prior to seeding.

14. Seed spreading will be achieved either using mechanical seed dispersal equipment or using manual methods. Bulking with a spreading agent such as sawdust, vermiculite or sand is desirable.

15. Rehabilitation will progressively follow mining with completed areas of the excavation being revegetated as soon as practicable, but within 12 months from closure of each section of the pit.

Irrigation

16. Experience with the previous regeneration on site, and by Landform Research in rehabilitation of quarries in limestone, has shown that when completed well there is no need for irrigation of the rehabilitation.

- **Erosion Control**

1. Soil erosion occurs when soil is exposed and disturbed by wind or water. Erosion involves soil particles being detached from areas not adequately protected by vegetation, and moved down-slope. This is not normally a significant problem in limestone which crusts after the first winter.

2. The soils are very permeable and runoff is normally minimal unless surface materials become non-wetting. Even so experience shows that there is minimal non wetting and surface particle movement under such conditions.

3. Water erosion on the batter slopes can be avoided by the permeability of the materials and by leaving the surface soft, rough and undulating, with the undulations running along contour. The final machinery run should be along contour and not down slope.

4. Wind erosion will be controlled by rehabilitating the disturbed ground as soon as practicable.

5. If wind erosion and soil stability become an issue measures will be taken to stabilise the soils. These could include but not be limited to fenced wind breaks, spray mulching, brushing, interim native vegetation or spreading mulch and vegetation.

6. For rehabilitation areas, revegetation will take place as soon as possible following landform and soil reconstruction.

7. Cleared vegetation will be transferred from an area being cleared, to protect against erosion, assist with habitat creation and provide a seed source.

8. Control of wind erosion potential will be assisted by spreading brush and vegetation across the topsoil on the batter slopes and reconstructed soils where local native vegetation is to be established.

- **Monitoring**

1. During late summer an assessment of the success of the rehabilitation will be made to determine the rehabilitation requirements for the following winter.

2. Monitoring includes visual assessments and, where necessary, counts to determine the success of the rehabilitation and restoration, as follows;

    - plant density
    - plant growth
    - plant deaths
    - regeneration
    - weed infestation

3. As necessary steps will be taken to correct any deficiencies in the vegetation.

4. Rehabilitation will be monitored for a period of three years to ensure that the revegetation meets the completion criteria of providing self sustaining indigenous shrub vegetation.

5. If rabbit damage is detected place bait using commercial baits laid under low concrete slabs. Rabbit damage has not proved a problem with the existing self regeneration.

6. Provide ongoing weed management to identify and treat significant environmental weeds or weeds likely to impact on the rehabilitation.

7. Revegetation that has not survived or does not meet the completion criteria are to be assessed to determine the number of replacement plants or seeding required.

8. In areas of rehabilitation that do not meet the completion criteria measures are to be taken to increase the stem density to achieve the completion criteria. This could include but not be limited to;

    - additional seeding,
    - planting additional tube plants,
    - additional use of fresh topsoil.

Temporary Closure

1. If for any reason the site is closed on a temporary basis for any period of time the following will be implemented.

2. The faces will be made safe or protected by bunds and/or fencing with signs in compliance with the *Mines Safety and Inspection Act 1994*.

3. All fluids, liquids and other materials that could leak over time, change or potentially impact on the environment will be removed from site, or stored in a manner that will not permit any environmental impact.

4. Mobile and other plant will be made safe or removed from site in compliance with the *Mines Safety and Inspection Act 1994.*

5. Fencing will be maintained to make the pit safe.

6. Perimeter signage will be maintained.

7. The site will be monitored for weeds and interim rehabilitation success twice per year.

8. Regular site inspections will be made to ensure compliance with the *Mines Safety and Inspection Act 1994,* and any other actions that are required to make the site compliant or environmentally sound will be made as the need arises.

Rehabilitation - Applicable Legislation / Policies
• *EPA, Guidance 6, Rehabilitation of Terrestrial Ecosystems*
Commitments to Rehabilitation
• The proponent will ensure the completed land surface is formed to the standards in the *Mines Safety and Inspection Act 1994 and Regulations 1995.* • The proponent will rehabilitate the surface as outlined above and monitor the revegetation as described above. • The conditions of the Clearing Permit will be complied with.

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ATTACHMENT 1

FLORA AND VEGETATION ASSESSMENT

LOT 471 MURRAY ROAD, QUALLILUP

TRIPLE M TRANSPORT LIMESTONE PIT

FEBRUARY 2017

FLORA AND VEGETATION ASSESSMENT

LOT 471
MURRAY ROAD, QUALLILUP

TRIPLE M TRANSPORT LIMESTONE PIT

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SUMMARY

Crushed Limestone is an essential resource to the State, for correcting soil acidity caused during normal farming operations through the use of nitrogenous fertilizer and legume crops. The need for crushed limestone is recognised by the Department of Agriculture and Food (Bulletin 4784) They have also recognised the importance of this operation in an area of few limestone resources in DAF Bulletin 4760.

This proposal seeks approval to access and progressively clear 16 hectares of resource over a period of ten years.

The application area goes to the boundary of Lot 502 because a current Mining Tement is held by Triple M Transport to enable excavation beyond that point.

The site lies in coastal vegetation at Dalyup west of Esperance. The only limestone in the area lies within the coastal dune network which almost everywhere is located within coastal reserves and Crown land.

The limestone on Lot 502 represents one of the few places where this material is available on private land. The site has operated as a limestone pit since 1999 through an Extractive Industries Licence and originally permission to clear through the *Soil and Land Conservation Act 1945*.

An Extractive Industry Licence is currently in place through the Shire of Esperance.

A vegetation Study has been completed by the Esperance Wildflower Society who did not record any Threatened or Priority species or any Threatened or significant Ecological Communities.

The size of the current pit is limited so there has not been the opportunity to undertake any significant rehabilitation. Rehabilitation will be undertaken progressively as the new ground is opened and the completed areas are excavated.

The vegetation is Beard Association 42, eaSi, Coastal dune scrub.

A Clearing Permit has been provided for the current pit and the rehabilitation has been shown to be rapid and highly effective.

Considering the location of this remnant vegetation, its general lack of agricultural capability, combined with the majority of the calcareous sand substrate being too low in grade for use as agricultural lime, there is little pressure on this vegetation type.

Proposal

It is proposed to clear nearly 16 hectares of Coasal Shrubland in stages backed by progressive rehabilitation. The ability to successfully regenerate the site has been proven at the existing operations.

The vegetation is listed as Beard Asscociation 42, Shrublands mallee and *Acacia* scrub on south coastal dunes.

CONTENTS

ATTACHMENTS

Flora Survey 2000, Esperance Wildflower Society
Flora Survey 2009, Esperance Wildflower Society
DER Clearing Permit CPS 4782/1
Database searches

Flora and Vegetation Assessment

Limestone Extraction, Lot 502 (471), Murray Road, Quallilup.

1.0 LIMESTONE PRODUCTION

Limestone has been mined from this site since 2000.

Approvals have been in place since that time and renewed until 2021.

1.1 Need for Lime for Agriculture

Crushed Limestone is an essential resource to the State, for correcting soil acidity caused during normal farming operations through the use of nitrogenous fertilizer and legume crops. The need for crushed limestone for use as agricultural lime is recognised by the Department of Agriculture and Food (Bulletin 4784).

Acidification of soils is seen as one of the major impediments to continued viable farming in Western Australia. The State Of the Environment Report Western Australia 2007 shows that about two thirds of the South West agricultural soils are at risk of acidification. When the acidity builds up essential nutrients become unavailable to plants and the crops reduce in vigour and eventually fail. In addition some other elements such as aluminium become soluble and lead to toxicity in stock and plants.

The normal method of treatment of soil acidity is to add agricultural lime and crushed limestone as explained in *Department of Agriculture and Food Bulletin 4784 Soil Acidity, A guide for WA farmers and consultants*. See Appendix 2.

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1.2 Local Resources of Limestone - Lime

The local limestone resources are very limited. To be most effective limestone has to be of the highest grade and, whilst coastal calcareous dunes and limestone do contain calcium carbonate, the grades are often too low for efficient and economic use. For example using limestone at half the calcium carbonate content will require double the amount, leading to additional land clearing, excavation and transport for no greater gain.

The other local factor is that much of the limestone and calcareous dunes are located within coastal Crown land and Reserves.

The excavation site and the surrounding local area is one of the few locations where high grade limestone occurs. The importance of the site is recognised in the *Department of Agriculture and Food Bulletin 4660, Survey of Western Australia agricultural lime sources*. On page 5 of that document it can be seen that the Triple M Transport Limestone at SCLS10 is the only lime source within the Esperance Area. The relevant pages from Bulletin 4660 are attached as Appendix 3.

Data from Bulletin 4660, of limestone from the pit, shows that the typical calcium carbonate content is 70% or over. Tests of the pit have revealed calcium carbonate content of 67% to 78%. (Appendix 8)

Other lime resources, such as the bare dunes to the east have only 40% calcium carbonate.

Lot 520 therefore represents a very valuable community resource.

Crushed Limestone is an essential resource to the State, for correcting soil acidity caused during normal farming operations through the use of nitrogenous fertilizer and legume crops. The need for crushed limestone is recognised by the Department of Agriculture and Food (Bulletin 4784) They have also recognised the importance of this operation in an area of few limestone sources in DAF Bulletin 4760.

Approvals in Place

An Extractive Industry Licence was granted by the Shire of Esperance on 30 October 2000 and renewed in October 2001 for a period of 21 years.

During the application for the Extractive Industries Licence there was a significant amount of liaison with the various Government Departments.

The existing sand excavations were considered by the Department of Environmental Protection under delegated authority from the EPA under *Part V of the Environmental Protection Act 1986*. The decision was "Informal Review with Public Advice Given". DEP Reference 147010.

The decision was appealed and dismissed by the Minister for the Environment on 12 June 2000.

A Clearing Permit, under the *Soil and Land Conservation Act 1945*, lapsed in 2002.

A Clearing Permit CPS 4782/1 was approved for the current limestone operations. An updated revegetation plan was provided for the existing operations in March 2012 and forms the basis for the rehabilitation methods used on site.

Consultation

Water and Rivers Commission (DOW) provided comment to the Shire of Esperance on 5 November 1999. Whilst the site is located in a Priority 1 groundwater area, it is on the very edge of that area adjacent to the Priority 2 zoning. There are no local water production bores. Figure 4 in Water and Rivers Commission 1999, Esperance Water Reserve Water Source Protection Plan, WRP 22.

Discussions and site inspection were conducted with Les Coyne from DEC on 22 October or November 1999 regarding flora and fauna. At that time there were no records of rare species.

2.0 METHODOLOGY

2.1 Aims of the Survey

The aims of the survey are to determine the significance of the vegetation and to determine whether there are any Declared Rare, Priority or Significant taxa present in the vegetation to be affected by the proposed clearing.

Site inspections were also made to assess the local need for limestone and the materials present on site, in addition to the methods of extraction and rehabilitation.

2.2 Methods of Survey

- ***On Ground Assessment***

The Esperance Wildflower Society conducted a survey of the area.

They completed a study of Lot 471 (502) in 2000. During that study they completed a series of five 20m x 20 m plots based on the methodology of *"Bushland Plant Survey" Wildflower Society of WA (Inc)* Publication, the same methodology used for the survey of many public reserves. The 2000 study is attached. That study was completed to the Wildflower Society Survey Methodology, "Bushland Plant Survey".

An additional study was conducted outside Lot 520, south towards the coast and an area to the south in 2008 and 2009. Whilst that study is not relevant to this proposal it does provide additional information on vegetation within the local area. The study is attached.

Lindsay Stephens of Landform Research visited the site in December 2009 and in several years since that time, lastly in spring 2015 and 2016, to review the excavation, vegetation and rehabilitation issues. No extensive additional flora study was possible because the vegetation had been burnt apparently in summer 2015 - 2016.

However on the intervening visits the vegetation was noted as being unchanged and the Esperance Wildflower Society studies are therefore regarded as remaining valid.

The studies straddle Environmental Protection Authority (2004) Guidance Statement, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, No 5,1 June 2004 and predate *EPA December 2016 Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment.* However the use of survey plots complies with a level 2 flora survey.

The vegetation assessment was conducted by the Esperance Wildflower Society to Environmental Protection Authority (2004) Guidance Statement, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, No 51 June 2004 and *"Bushland Plant Survey" Wildflower Society of WA (Inc).*

This write up has sought to provide updated information with respect to the plant communities and their conservation significance.

Soil and regolith mapping and assessment of the geomorphology was conducted by Lindsay Stephens at the time of the site inspections. Soil and regolith mapping has been found to be very closely aligned to species composition, through extensive field mapping by Landform Research, with small changes to the clay or sesqui-oxide content being related to the introduction and deletion of particular indicator species.

Comparisons were made to databases of Regolith and Vegetation Communities held by Landform Research and the field experience of Lindsay Stephens.

- ***Desktop Reviews***

The DPaW Rare and Priority Flora and Ecological Communities databases were searched through Naturemap for a 10 km radius. See attached.

The Protected Matters Search Tool, Commonwealth Department of Environment for a 10 km radius was searched. See attachment.

Determinations and inferences on the Vegetation Complexes and Floristic Community Types were made in a number of ways, by the Esperance Wildflower Society relating to comparisons to published floristics and geomorphic and regolith matching. The following documents were used in the reporting.

Soil and regolith mapping and assessment of the geomorphology were made with comparisons to the known distributions of species and communities.

The databases listed under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* were also searched. These are attached.

During the surveys the vegetation on site was walked, photographs taken, transects completed, the species identified, the soils noted and the vegetation structure recorded.

Determinations and inferences on the Vegetation Complexes and Floristic Community Types were made in a number of ways, field survey and plots, relating to comparisons to published floristics and geomorphic and regolith matching.

- Comparisons were made to published boundaries of Vegetation Complexes in Beard J S, 1973, *Vegetation Survey of Western Australia, Esperance and Malcom Areas, 1: 250 000 Series*. Vegmap Perth.

- Comparison to geology maps Meyers J S, 1995, *1 : 1 050 000 Esperance Sheet,* Geological Survey of Western Australia.

Limitations of the Survey

The surveys were conducted at an appropriate time of the year. Even though the last survey was completed in 2009 a number of surveys have been conducted and the site inspected and visited in spring in the intervening years.

No changes were recorded by Landform Research in 2009, and spring 2015 and 2016.

Unfortunately the vegetation was burnt in the summer of 2015 – 2016 and a repeat survey is not possible at this time.

Considering the nature of the vegetation on site, its level of past and current disturbance, the intervening observations, the limitations are not considered significant and the assessment by the Esperance Wildflower Society is considered to remain valid.

3.0 PHYSICAL ENVIRONMENT

3.1 Site Description

The site lies approximately 40 km west from Esperance at the end of Murray's Road on the eastern side of Lake Quallilup, 300 metres from the lake and 500 metres from the closest portion of coast.

The elevation of the site is up to 40 - 60 metres. The geology is a series of calcareous dunes that are variably calcium carbonate content and inconsistently lithified. The dunes which are interpreted to be up to 20 – 60 metres in thickness are draped over a steeply undulating granite basement which is not exposed on site. The only exposure of the granite is on the coastal fringe about 1 km south of the pit.

The original parts of the site were cleared, and some vegetation was cleared under an approval some years ago with a permit obtained through the *Soil and Land Conservation Act 1945*, which lapsed in 2002. During that process there was extensive liaison between the Government Departments. (Original Approval Number 074/99). (Appendix 7 page 17).

Climate

The climate is semi-arid Mediterranean. Climate is recorded at Esperance although local rainfall data is available. Temperatures average up to maxima of around 25 degrees in summer and down to 17 degrees in winter. Minima range from around 15 down to 7 degrees summer to winter.

Rainfall locally is approximately 625 mm per year based on farm data. Most of the rain falls in the months May to August inclusive. Evaporation is approximately 1700 mm per year. (Water and Rivers 1997 WRAP 5).

Hydrology

Lake Quallilup is a permanent lake that is fed via overflow from the Dalyup River feeding into Lake Gore to the north west. It is a saline to brackish lake depending on the volume of water flowing into it.

Lake Gore and reserve land west of Lake Quallilup is classified as a RAMSAR Wetland. Lake Quallilup is not listed as a RAMSAR Wetland but this does not diminish its conservation values. The pit is 300 metres from Lake Quallilup. Quarrying over the past 10 years has not revealed any impact on the lake or any disturbance on the intervening vegetation and habitats.

Rainfall on the proposed excavation area infiltrates vertically downwards to a deep granite basement well below the base of the limestone pit. The base of the pit is at approximately 40 metres AHD.

In locations such as this, adjacent to the ocean and a lake, the water table is normally close to 1 – 5 metres AHD unless perched within a valley of the granite basement. Groundwater flow will either be west to Lake Quallilup or south to the cost if there is a rise in the granite basement west of the pit, although there is no evidence of this.

The site lies on the western edge of a Priority 1 Groundwater Protection Area near the boundary of Priority 2. There are no production bores in the local area and ground water flow is west and south away from the protection area. In 1999 the Water and Rivers Commission (DOW) did not object to the existing quarry.

The base of the pit is therefore some 30 metres above the highest known water table and well within the compliance of the Department of Water guidance of a 3 metre separation between the base of an excavation and the highest known water table in a Priority 1 Groundwater Protection Area.

The pit only operates during the summer months.

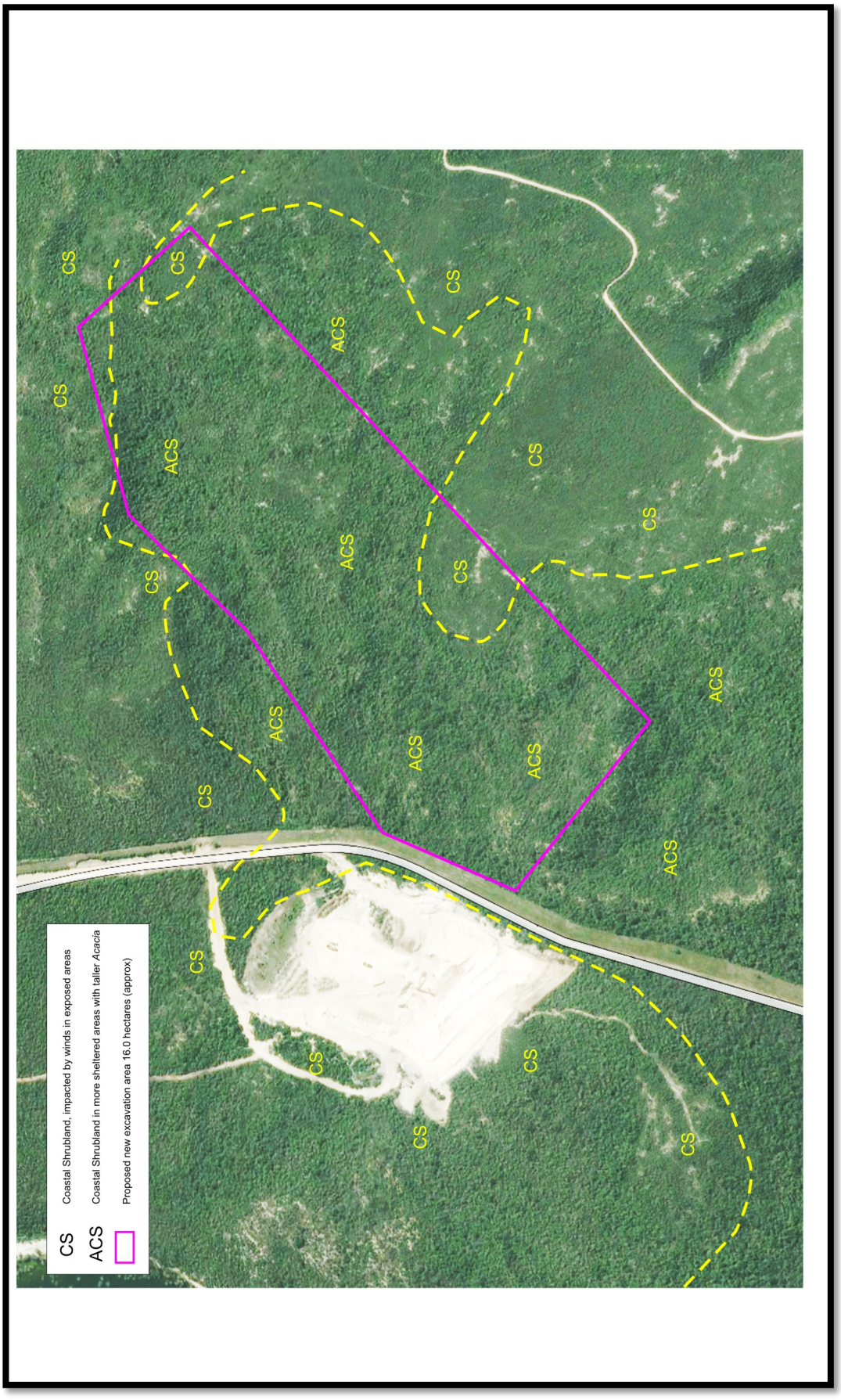

Figure 1 – 1 Vegetation communities

Figure 1 - 2 Coastal shrubland on the resource area

Figure 1 - 3 Coastal shrubland on the resource area

Figure 1 - 4 Coastal *Acacia* shrubland on the swales of the resource area

Figure 1 - 5 Coastal *Acacia* shrubland adjacent to the current resource area

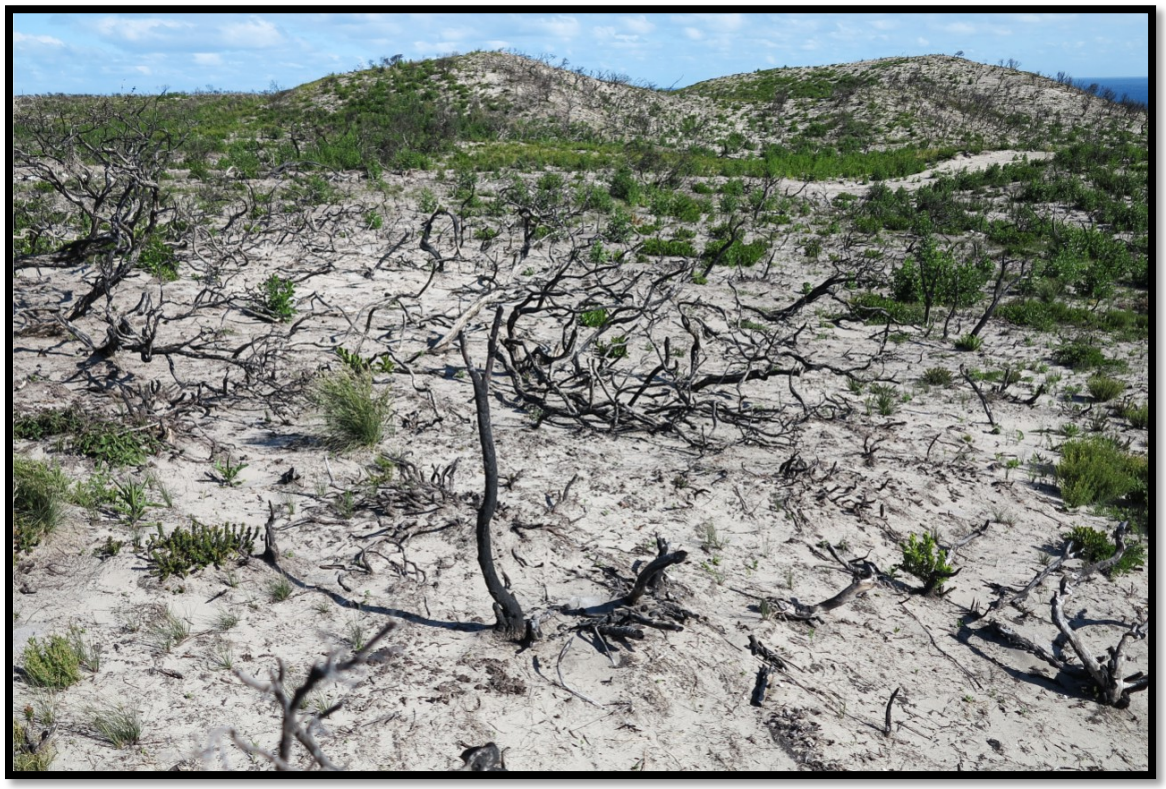

Figure 1 - 6 Resource area in spring 2016

Figure 1 - 7 Resource area in spring 2016

4.0 VEGETATION ASSESSMENT

4.1 Community Types

The vegetation was assessed by the Esperance Wildflower Society in 2000 and 2009. These studies are attached.

The vegetation is listed as dense Low Coastal Heath typified by *Acacia Cyclops, A. cochlearis* and *A. rostellifera* over *Spyriduium globulosum, Hibbertia racemosa, Melaleuca pentagona, M. pulchella* and *Leucopogon parviflorus*.

On the excavation site there are two main vegetation types.

Low Coastal Heath, dominated by the coastal species with reduced proportion of *Acacia* and stunted *Acacia Cyclops* and *Acacia rostellifera*.

In October 2016 the resource area was again reviewed and even though it had been burnt the vegetation was still confirmed as the coastal vegetation types with the species observed by Lindsay Stephens of Landform Research as Coastal vegetation regrowth. Even though the burnt vegetation made identification difficult the following species were observed; and typified by;

> *Phyllanthus calycinus, Acacia cyclops, Desmocladus flexuosus, Spyridium globulosum, Acacia cochlearis, Muehlenbeckia adpressa, Lepidosperma squamatum?, Melaleuca pulchella, Calothamnus quadrifidus, Anthocercis littorea, Velleia trinervis, Austrostipa flavescens?, Scaevola crassifolia, Goodenia tripartitia*

In the more protected swales the proportion and influence of the *Acacia Cyclops* and *Acacia rostellifera* increase to provide a coastal vegetation towards *Acacia* Thicket. The proportion of *Acacia* also relates to fire succession and frequency.

In the site inspections conducted by Lindsay Stephens of Landform Research on at least four occasions between 2000 and 2016, most recently in the spring of 2015 and 2016, no *Banksia* were recorded in the area proposed for the current excavation. The *Hakea* recorded were well to the east, off the proposed excavation area.

The vegetation of the proposed excavation area is Coastal Heathland and not the Proteaceous Communities that are listed as Significant and Threatened.

As noted below the Proteaceae vegetation grows on neutral to acidic sands and gravel soils and not on the calcareous alkaline soils of the exposed coastal dunes.

The vegetation is typical of the coastal vegetation around much of the south coast.

The vegetation is classified by Beard 1973, DEC (DER 2012, as;

> eaSi, Coastal dune scrub. This equates to Beard Association 42.

There is no *Banksia* Scrub or Proteaceous shrubland or woodlands on the proposed excavation area.

The 2008 – 2009 Esperance Wildflower Society assessment to the south outside outside the resource area did note some Proteaceae species but these are outside Lot 520. Only two Proteaceae species were identified, *Grevillea pauciflora* and *Hakea nitida.*

DEC (DER) 2012 Recorded the vegetation as 95 % Beard Association 42 and the remainder Beard Association 125. Both are above the Threshold of 30% according to DEC 2012. Beard Association 125 is Bare Areas Salt Lakes which does not describe the area to be cleared.

4.2 Vegetation on Site

- **Species List**

The species recorded during the site investigation for the existing pit in 2000 was a total of 41 species, which is relevant to the proposed excavation, with an additional two additional exotic species. See attached survey

As noted above only two Proteaceae species were identified, *Grevillea pauciflora* and *Hakea nitida.*

The 20098 - 2009 survey which went well beyond the excavation area identified 75 species of which 8 were identified as weed species.

O

- **Plant Density**

The vegetation is dense and the data from the 20 m x 20 m plots recorded the plant density.

- **Vegetation Structure**

The vegetation structure is recorded in the flora survey with 70% shrubs under 1 metre and 10 – 30% being sedges.

See Vegetation Condition below.

5.0 SIGNIFICANT VEGETATION

5.1 Declared Rare, Priority or Significant Taxa

Databases held under State Legislation and EPBC legislation were searched.

No plant species or taxa are listed under *the Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.

The only taxa listed on Naturemap as occurring within a 10 km radius is *Leucopogon* sp Lake Magenta (P1), *Banksia prolata* subsp *calcicola* (P4) and *Eucalyptus preissiana* subsp *lobata* (P4).

No *Banksia* was recorded in the 2000 study but *Banksia speciosa* was recorded outside Lot 502 in the 2009 study by the Esperance Wildflower Society. The only Eucalypt recorded was *Eucalyptus angulosa* which was recorded outside Lot 502.

Two *Leucopogon* were recorded in 2000 and not identified. They were identified in 2009 outside Lot 502 as *Leucopogon rotundifolius* and *Leucopogon pleurandroides*.

Vegetation on site will be providing habitats for birds and other small fauna, but with its sparseness on the low ridge the number of fauna species is likely to be significantly restricted.

No plant recorded is listed as a Threatened or Priority species.

5.2 Threatened or Priority Ecological Communities

Databases held under State Legislation were searched.

No Declared Threatened, Priority Species, Significant flora or Threatened or significant ecological communities were identified during the vegetation assessment conducted by the Esperance Wildflower Society.

The Proteaceous dominated vegetation, ***Proteaceae dominated kwongkan shrublands of the south east coastal floristisc provence of Western Australia***, is listed as Threatened under the *EPBC Act 1999*. A Conservation Advice is provided for that plant community and includes extensive species lists. The species lists provided are not typical of those found on Lot 502 which on the resource area is coastal heath.

The ***Scrub heath on deep sand with Banksia and Lambertia, and Banksia scrub heath on Esperance Sandplain*** is listed as Priority 3 Community on State Conservation Lists.

The vegetation on the resource area is not representative of these communities.

5.3 EPBC Legislation

Databases held under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* were searched.

Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia is listed as an Endangered Community. This community is dominated by Proteaceae species, in particular *Banksia, Hakea* and *Lambertia* and occurs on neutral to acidic silica sands and gravelly soils, neither of which occur on site.

The vegetation on site is Coastal Shrubland and does not contain significant Proteaceae species and is located on calcareous coastal sands.

The 2009 vegetation survey, outside the proposed excavation area, did record occasional *Banksia speciosa* on older soils off the calcareous sands and not in the survey plots.

6.0 VEGETATION CONDITION

The Vegetation Condition Score used in this study is that used in Bush Forever 2000. The condition is excellent.

Using the vegetation condition score developed by Kaesehagen 1995 the vegetation is generally classified as Very Good – Excellent.

Vegetation Condition – Landform Research 2015

VEGETATION STRUCTURE	HEIGHT	Eastern Sand Resource
Overstorey	> 4 m	Absent Not part of the original community
Tall Shrub layer	2 – 4 m	Absent Not part of the original community
Lower Shrub Layer	0.5 – 2 m	Typical Coastal shrubland in Excellent Condition.
Ground Cover	<0.5 m	Typical Coastal shrubland in Excellent Condition.

- The Vegetation Condition Score used in this study is that used in EPA Guidance 2016.

7.0 REPRESENTATION OF THE FLORA - VEGETATION

7.1 Vegetation Representation

EPA Position Statement No 2, December 2000, *Environmental Protection of Native Vegetation in Western Australia*, specifically targets the retention of native vegetation in the Agricultural Areas in *4.1, Clearing in the agricultural areas for agricultural purposes*. In 4.3, *Clearing in other areas of Western Australia*, it is unclear what "other areas" refers to, but may refer to retention of a 30% threshold in non agricultural areas.

Section 4.3 *Clearing in other areas of Western Australia*, (EPA Position Statement No 2, December 2000) expects that clearing will not take vegetation types below the 30% of the pre-clearing vegetation as recommended by ANZECC, 1999, *National Framework for the Management and Monitoring of Australia's Native Vegetation*. The National Objectives and Targets for Biodiversity Conservation 2001 - 2005 (Commonwealth of Australia 2001) also recognise 30% as the trigger value.

The coastal vegetation is included with Proteaceae shrubland vegetation in the mapping by Beard 1973. This shows the Esperance and Malcom Areas having the same vegetation as occurring along the coast from well to the west and east for over 200 km.

NRM mapping shows the site as;

> Vegetation Type 1914 Type 1, Description Shrublands, *Banksia* scrub heath on the coastal plains in the Esperance Plains Region.
>
> Vegetation Association – 7048, Shrublands; *Banksia* scrub-heath on coastal plain in the Esperance Plains.
>
> NVIS Lv2, Structural formation - Open Shrubland.
>
> NVIS Lv3, Floristic Formation - *Banksia* Open Shrubland

However this classification is generallised and does not represent the on site vegetation.

The vegetation is listed as Beard Association 42, Shrublands mallee and *Acacia* scrub on south coastal dunes. This is also concluded by DEC (DER) 2012 in the Vegetation Clearing Assessment Report for the existing quarry.

Shepherd et al 2002, Native Vegetation in Western Australia Extent, Type and Status, Department of Agriculture and Food Resource Management Technical Report 249 lists Vegetation Association 42 as having;

> Pre-European extent of 370 327 hectares of which 357 275 hectares remains. This represents 96.5% of the original extent.
>
> Of the remaining vegetation 46.8% is located within IUCN Class I – IV Reserves, 0.0% is located within other Reserves and 0.0% is located within pastoral leases managed by DPAW.

The large areas of vegetation linkages that remain and will be re-established at the end of mining can be seen in the figures included in the main report. The success of the rehabilitation to date can be seen in the following photographs.

Considering the location of this remnant vegetation, its general lack of agricultural capability, combined with the majority of the calcareous sand substrate being too low in grade for use as agricultural lime, there is little pressure on this vegetation type.

With rehabilitation there will be the opportunity to return local species to the site.

Figure 1 - 8 Rehabilitation to local native vegetation

Figure 1 - 9 Rehabilitation to local native vegetation

8.0 CLEARING ASSESSMENT

Clearing is controlled under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. These regulations provide for a number of principles against which clearing is assessed.

	CLEARING PRINCIPLE *(Schedule 5 Environmental Protection Amendment Act, 1986*
1a	*High Level of diversity*
1b	*Significant fauna habitat*
1c	*Necessary to existence of Rare flora*
1d	*Threatened Ecological Community*
1e	*Significant area of vegetation in an area that has been extensively cleared*
1f	*Wetland or watercourse*
1g	*Land degradation*
1h	*Impact on adjacent or nearby conservation areas*
1i	*Deterioration of underground water*
1j	*Increase flooding*

The *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* provide for planning and other policy issues to be taken into account when determining clearing applications.

Section 51O of the *Environmental Protection Act 1986* allows the CEO to take planning matters into account when making clearing decisions, such as a State Planning Policy.

As well as considering Biodiversity and other conservation issues the Clearing Principles that have to be satisfied are apparently designed for rural regions and do not adequately address the issues of resource needs. Therefore some additional principles need to be added when considering the need for essential Raw Materials. In an attempt to provide a better balance to the clearing principles those principles have been expanded as listed in the tables below.

The issue of clearing native vegetation and fauna habitat cannot therefore be considered separately but must be considered in terms of community needs.

The proposal therefore has been assessed under the Clearing Principles of the Environmental *Protection (Clearing of Native Vegetation) Regulations 2004,* and the additional considerations below, to provide an assessment of the likely impacts of the proposal.

	ADDITIONAL CLEARING PRINCIPLES – EXTRACTIVE INDUSTRIES
Environmental Protection Act 1984 Section 51O Planning Matters	
1	*Planning Matters*
Environmental Protection Act 1984 Section 51O Relevant Matters	
2a	*Need for the resource*
2b	*Classification of the resource and existing approvals*
2c	*Availability of alternative resources and the impact of their use*
2d	*Proposed final land use*
2e	*Offsite Environmental impacts if the resource is not used*
2f	*Sound environmental management and rehabilitation*

Assessment against the Clearing Principles

	CLEARING PRINCIPLE *(Schedule 5 Environmental Protection Amendment Act, 1986).*	**COMMENT**
1a	High Level of diversity	• The site has been assessed in the flora surveys by the Esperance Wildflower Society 2000 and found to have a relatively low level of diversity with just 41 taxa of which two were exotic. A further study by the Esperance Wildflower Society, outside the proposed excavation recorded 75 species of which 8 were identified as Weed Species. • Even so the vegetation is in generally excellent condition and is typical of large areas of the south eastern coastal vegetation. • The vegetation does not include the species diverse Proteaceae rich vegetation but consists of coastal Shrubland on coastal calcareous soils. • See Esperance Wildflower Reports. *The proposed clearing is not at variance with this principle.*
1b	Significant fauna habitat	• The vegetation will be providing habitat for local species. But has been burnt and is only just recovering. • The Esperance Wildflower Society recorded the presence of kangaroo droppings and 12 species of bird. DEC 2012 did not record any Threatened fauna, but did note that even though the Hooded Plover has been recorded locally they considered that the clearing of the previous vegetation would not constitute a significant impact on the Plovers. • Revegetation is to local native species. See Figure 1 – 8 and 1 – 9, which has demonstrated to be capable of high quality revegetation. • The large areas of vegetation linkages that remain and will be re-established at the end of mining can be seen in the figures included in the main report. The success of the rehabilitation to date can be seen in the following photographs. • Whilst habitat will be cleared progressively, it will be replaced at the end of excavation by similar species composition that will be capable of developing into similar habitat to the pre-mined vegetation. • Current and past mining does not generate significant amounts of dust. • There is no evidence of disturbance to adjoining vegetation. The site is only worked during the summer months. *The proposed clearing is not at variance with this principle.*
1c	Necessary to existence of Rare flora	• No Threatened (Declared Rare) or Priority Flora was found. A few plants of *Leucopogon rotundifolius*, were located in 2009, south of the proposed excavation and clearing, in a more varied

		set of coastal heath microhabitats. *The proposed clearing is not at variance with this principle.*
1d	Threatened Ecological Community	• No Priority or Threatened Ecological Community occurs on site. *The proposed clearing is not at variance with this principle.*
1e	Significant area of vegetation in an area that has been extensively cleared	• Most of the coastal heathlands in the south east remain. There is little pressure for clearing. The soils have low agricultural capability and the coastal sands are normally of low calcium carbonate content that is unsuitable for lime manufacture. • *Shepherd et al 2002, Native Vegetation in Western Australia Extent, Type and Status, Department of Agriculture and Food Resource Management Technical Report 249* lists Vegetation Association 42 as having; Pre-European extent of 370 327 hectares of which 357 275 hectares remains. This represents 96.5% of the original extent. Of the remaining vegetation 46.8% is located within IUCN Class I – IV Reserves, 0.0% is located within other Reserves and 0.0% is located within pastoral leases managed by DPAAW. • The large areas of vegetation linkages that remain and will be re-established at the end of mining can be seen in the figures included in the main report. The success of the rehabilitation to date can be seen in the attached photographs. • Considering the location of this remnant vegetation, its general lack of agricultural capability, combined with the majority of the calcareous sand substrate being too low in grade for use as agricultural lime, there is little pressure on this vegetation type. • With rehabilitation there will be the opportunity to return local species to the site. • The vegetation already meets the 30% retention criteria with 96.5% remaining. *The proposed clearing is not at variance with this principle.*
1f	Wetland or watercourse	• The site lies east of Lake Quallilup with a separation of 300 metres. • The site is elevated at 40 – 60 metres AHD with groundwater flow deep below the base of the pit. • Water and Rivers (DOW) reviewed the existing pit proposal prior to commencement and did not raise any objections. Water and Rivers Commission (DOW) provided comment to the Shire of Esperance on 5 November 1999. • This pit is further from Lake Quallilup. Whilst the site is located in a Priority 1 groundwater area, it is on the very edge of that area adjacent to the Priority 2 zoning. There are no local water production bores. • Discussions and site inspection were held with Les Coyne from DEC on 22 October or November 1999 regarding flora and fauna. At that time there were no records of rare species. • There is no evidence of any changes to native vegetation as a result of the access road as shown by examination of the vegetation adjacent to that road. *The proposed clearing is partially at variance with this principle.*
1g	Land degradation	• The excavation can continue to be managed in a manner that does not lead to degradation of the soil and land integrity apart from normal development issues. • There is no evidence of any changes to native vegetation as a result of the access road as shown by examination of the vegetation adjacent to that road.

		• Certainly the land is cleared and temporarily denuded, but the existing rehabilitation has demonstrated that the disturbance is temporary and that good ecological values can be restored. Landform values return as the excavated surface is revegetated. • The DEP assessed the site under Part V of the EP Act 1986 on behalf of the EPA for the existing pit. The level of assessment was set at Informal Review with Public Advice Given. This was appealed and dismissed. • The excavation is a temporary disturbance to the land and with rehabilitation and time a new habitat will develop to replace that lost. See Figures 7 and 8. *The proposed clearing is partially at variance with this principle.*
1h	Impact on adjacent or nearby conservation areas	• Lake Quallilup is not part of the RAMSAR listed wetland system of Lake Gore but this does not change the ecological values of Lake Quallilup. • The buffer to Lake Quallilup will be 300 metres. This buffer is limited by the distribution of the high calcium carbonate resource which only occurs in this area at the proposed location with some extension onto Crown land to the east. • Reserve 30672 adjoins to the east and south. During excavation since 2000 there have been no impacts on that reserve from the quarrying activities. • Biodiversity values will over time return. • DEC 2012 did not find that the presence of Lake Quallilup was an impediment to CPS4782/1 and the proposed pit and clearing is further away. *The proposed clearing is not at variance with this principle.*
1i	Deterioration of underground water	• Quarrying is one of the few activities permitted in Public Drinking Water Source Areas. • The site lies east of Lake Quallilup with a separation of 300 metres. • The site is elevated at 40 – 60 metres AHD with groundwater flow deep below the base of the pit. • Water and Rivers DOW) reviewed the proposal prior to commencement and did not raise any objections. Water and Rivers Commission provided comment to the Shire of Esperance on 5 November 1999. Whilst the site is located in a Priority 1 groundwater area, it is on the very edge of that area adjacent to the Priority 2 zoning. There are no local water production bores. Figure 4 in Water and Rivers Commission 1999, Esperance Water Reserve Water Source Protection Plan, WRP 22. • The existing mining operations have demonstrated that excavation can take place with no impact on the surface or intermittent lake water and that rehabilitation can be very successful. • The DEP assessed the site under Part V of the EP Act 1986 on behalf of the EPA. The level of assessment was set at Informal Review with Public Advice Given. This was appealed and dismissed. • Excavation since 2000 has not shown any detriment to the local water quality in the groundwater or Lake Quallilup. Changes to the salt content of the lake water occur as a result of flow volumes in the Dalyup River. • DEC 2012 did not find that the presence of Lake Quallilup was an impediment to CPS4782/1 and the proposed pit and clearing is further away. *The proposed clearing is not at variance with this principle.*
1j	Increase flooding	• The site is high in the landscape and, with a relatively small area of clearing, will have no observable impact on water elevations in Lake Quallilup. • There is no evidence of the access roads impacting on water

		regimes, flooding or surrounding vegetation. *The proposed clearing is not at variance with this principle.*

ADDITIONAL CLEARING PRINCIPLES – EXTRACTIVE INDUSTRIES		**COMMENT**
Environmental Protection Act 1984 Section 51O Planning Matters		
1	*Planning Matters*	• The limestone is not classified under any planning documents as a special resource. However as the location is within the agriculture area this is normal in such areas. • The limestone is recognised by the Department of Agriculture and Food as an important resource. See 2a below. • An Extractive Industry Licence was granted by the Shire of Esperance on 30 October 2000 and renewed in October 2001 for a period of 21 years. • During the application for the Extractive Industries Licence there was a significant amount of liaison with the various Government Departments. *The proposed clearing is compatible with this factor.*
Environmental Protection Act 1984 Section 51O Relevant Matters		
2a	*Need for the resource*	• The limestone resources are recognised by the Department of Mines and Petroleum and Department of Agriculture and Food as being highly significant resources for the continued production of agriculture lime. • Agriculture lime is essential to combat increasing soil acidity in the Esperance Region, and the number of high grade deposits is very low. • This site is listed in Department of Agriculture and Food bulletins as a source of agriculture lime. • Whilst limestone is common in coastal areas most of the resources are of lower grade. Low grade resources require much greater volumes to be used, significantly increasing excavation and transport costs and ground disturbance. For example much of the coastal dunes have a calcium carbonate content of only 40%. Therefore the resource being excavated with up to 78% will require only about half the tonnage of the locally common limestone and limesand to have the same acid soil mitigation effect. • See Appendices 1 to 3. *The proposed clearing is compatible with this factor.*
2b	*Classification of the resource and existing approvals*	• An Extractive Industry Licence was granted by the Shire of Esperance on 30 October 2000 and renewed in October 2001 for a period of 21 years. Shire of Esperance Resolution 0208-1260. • During the application for the Extractive Industries Licence there was a significant amount of liaison with the various Government Departments. *The proposed clearing is compatible with this factor.*
2c	*Availability of alternative resources and the impact of their use*	• There are few to no alternative resources. If this limestone is not used, it will have to be sourced from outside the area or from lower grade deposits both of which result in higher costs to the farming operations and significant additional greenhouse gas emissions. • Whilst limestone is common in coastal areas most of the resources are of lower grade. Low grade resources require much greater volumes to be used, significantly increasing excavation and transport costs and ground disturbance. For example much of the coastal dunes have a calcium carbonate content of only

		40%. Therefore the resource being excavated, with up to 78% calcium carbonate will require only about half the tonnage of the locally common limestone and limesand to have the same acid soil mitigation effect. • Taking limestone from elsewhere simply transfers any environmental issues elsewhere. It does not negate environmental impacts. • High grade limestone is very patchily distributed locally and is not common. *The proposed clearing is compatible with this factor.*
2d	*Proposed final land use*	• The proposed final land use is to return the site to local native vegetation. • An approved revegetation plan is in place and rehabilitation has been demonstrated to be very successful. See Figure 1 – 8 and 1 – 9. *The proposed clearing is compatible with this factor.*
2e	*Offsite Environmental impacts if the resource is not used*	• Not taking the resource will result in limestone having to be imported from elsewhere or, if available, from other areas that will also likely require clearing. Any alternative area may not offer any better environmental impacts. • If lower grades are used the volumes of limestone required to neutralize the soils will be greater. This will contribute additional greenhouse gas emissions. *The proposed clearing is compatible withthis factor.*
2f	*Sound environmental management and rehabilitation*	• Environmental and rehabilitation management procedures are in place. • The rehabilitation conducted to date has been excellent. See Figures 1 – 8 and 1 – 9. • The various Government authorities had input to the opening of the resource. • See above. *The proposed clearing is compatible with this factor.*

9.0 DISCUSSION

The vegetation study was completed by the Esperance Wildflower Society.

No Threatened (Declared Rare), Priority species or Significant flora, or Threatened or Priority Communities/Complexes were recorded from the proposed excavation area.

The excavated area will be returned to local native species and a rehabilitation plan is in place.

The 16 ha (approximately) of vegetation will be progressively cleared with a return to local native vegetation.

Past excavations since 2000 have demonstrated that the adjoining vegetation and Lake Quallilup have not been impacted on.

In the longer term therefore the effects of clearing, excavation and revegetation will help negate any impact of mining and should lead to no general loss of biodiversity, although locally there will be some changes to habitat, with more deeper water habitat replacing some of the low ridge vegetation.

The amount of clearing is small in relation to the large areas of similar habitats along the coast of the South East. The clearing of the vegetation and return to local native vegetation will not significantly impact on Beard Vegetation Association 42.

REFERENCES

ANZECC, 1999, *National Framework for the Management and Monitoring of Australia's Native Vegetation*.

Beard J S, 1973, *Vegetation Survey of Western Australia, Esperance and Malcom, 1: 250 000 Series*. Vegmap Perth.

Myers J S, 1995, *1 : 1 000 000 Geological Series, Esperance,* Geological Survey of Western Australia.

Chamber of Commerce and Industry, 1995 and 1996, *Managing the Basic Raw Materials of Perth and the Outer Metropolitan Region*, Parts 1 and 2.

Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Commonwealth of Australia, 2001, *National Objectives and Targets for Biodiversity Conservation 2001 – 2005.*

Environmental Protection Authority (2004) Guidance Statement, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, No 5,1 June 2004.

Environmental Protection Authority, Guidance 10, *Level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region.*

Environmental Protection Authority, Position Statement No 2, December 2000, *Environmental Protection of Native Vegetation in Western Australia*.

Kaesehagen, 1995, *Bushland Condition Mapping*, IN Invasive Weeds and Regenerating Ecosystems in Western Australia, Proceedings of Conference held at Murdoch University, July 1994, Institute for Science and Technology Policy, Murdoch University.

RARE AND SIGNIFICANT FLORA AND VEGETATION NOTES

1.0 RARE AND SIGNIFICANT FLORA AND VEGETATION

Flora can be significant on the basis of features of the taxa, its distribution and rarity. Flora as a vegetation community or complex can also be significant based on similar principles. The most commonly used determinants of significance are listed below.

A number of flora are regarded as significant even though they may not be listed as Declared Rare or Priority species. "Significant flora" and "Significant vegetation" are defined in Environmental Protection Authority (2004) Guidance Statement, Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia, No 51, June 2004.

Species, subspecies, varieties, hybrids and ecotypes may be significant for a range of reasons, other than as Declared Rare Flora or Priority flora, and may include the following:

- *a keystone role in a particular habitat for threatened species, or supporting large populations representing a significant proportion of the local regional population of a species;*
- *relic status;*
- *anomalous features that indicate a potential new discovery;*
- *being representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);*
- *the presence of restricted subspecies, varieties, or naturally occurring hybrids;*
- *local endemism/a restricted distribution;*
- *being poorly reserved.*

1.1 DECLARED RARE FLORA

Species specially protected under the Wildlife Conservation Act 1950*, as identified in the current listing. Normally listed within a Wildlife Conservation (Rare Flora) Notice; Schedule 1 Extant taxa.*

R: Declared Rare Flora – Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare , in danger of extinction, or otherwise in need of special protection and have been gazetted as such.

X: Declared Rare Flora – Presumed Extinct Taxa

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

1.2 PRIORITY FLORA

Lists of plant taxa, maintained by the Department of Conservation and Land Management that are either under consideration as threatened flora but are in need of further survey to adequately determine their status, or are adequately known but require monitoring to ensure their security does not decline.

1: Priority One – Poorly known taxa

Taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, eg road verges, urban areas, farmland, active mineral leases, etc, or the plants are under threat, eg from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declarations as "rare flora", but are in urgent need of further survey.

2: Priority two – Poorly known taxa

Taxa which are known from one or a few (generally <5) populations, at which some at least are not believed to be under immediate threat (ie currently not endangered). Such taxa are under consideration for declarations as "rare flora", but are in urgent need of further survey.

3: Priority Three – Poorly known taxa

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (ie not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declarations as "rare flora", but are in urgent need of further survey.

4: Priority Four – Poorly known taxa

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5 – 10 years.

Significant Vegetation

Vegetation may be significant for a range of reasons, other than a statutory listing as Threatened Ecological Communities or because the extent is below a threshold level, and may include the following reasons:

- *scarcity;*
- *unusual species;*
- *novel combination of species;*
- *a role as a refuge;*
- *a role as a key habitat for threatened species or large populations representing a significant proportion of the local to regional total population of a species;*
- *being representative of the range of a unit (particularly, a good local and/or regional example of a unit in "prime" habitat, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);*
- *a restricted distribution.*

1.3 THREATENED ECOLOGICAL COMMUNITY

Ecological communities that have been assessed through a procedure (coordinated by CALM) and assigned to one of the following categories related to the status of the threat to the community. (EPA Guidance Statement No 51 2004).

Presumed Totally Destroyed

Critically Endangered

<10% of the pre-European extent remains in an intact condition in the bioregion.

Endangered

10 – 30% of pre-European extent remains

Vulnerable

Declining and/or has declined in distribution and/or condition, and whose ultimate security is not yet assured (it could move into a category of higher threat in the near future if threatening processes continue)

1.4 PRIORITY ECOLOGICAL COMMUNITY

Ecological communities that have been assessed through the procedures for Threatened Ecological Communities, but do not meet the criteria although still potentially at risk are assigned to one of the following categories related to the status of the threat to the community. (Definitions and Criteria for Priority Ecological Communities, DEC and CALM Policy Statement No 9).

Priority One

Poorly known ecological communities that are very restricted and not actively managed for conservation.

Priority Two

Poorly known ecological communities that are restricted and mostly actively managed for conservation

Priority Three

Poorly known ecological communities that are of more widespread occurrence, which may not be well reserved or subject to disturbance pressures or significant communities that are not under threat.

Priority Four

Communities that are adequately known, but rare and not threatened, or are near the status of Threatened. They are divided into Rare, Near Threatened or communities removed from the Threatened List.

Priority Five

Communities that are not threatened, but are dependent on conservation for their survival.

1.5 COMMONWEALTH LEGISLATION

Some vegetation communities or plant taxa that are very rare or of National importance are listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

Databases held under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 can be searched.

1.6 REPRESENTATION OF VEGETATION COMMUNITIES

The significance of the flora depends on a number of issues.

- *Rare, Priority or Significant species may be present.*
- *A Threatened Ecological Community may be present.*
- *The development may take the area of the particularly vegetation community or complex below desirable levels or guidelines.*
- *There may be an aspect of the flora that may be listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.*

EPA Position Statement No 2, December 2000, Environmental Protection of Native Vegetation in Western Australia, specifically targets the retention of native vegetation in the Agricultural Areas in 4.1, Clearing in the agricultural areas for agricultural purposes. In 4.3, Clearing in other areas of Western Australia, it is unclear what "other areas" refers to, but may refer to retention of a 30% threshold in non agricultural areas.

Section 4.3 Clearing in other areas of Western Australia, (EPA Position Statement No 2, December 2000) expects that clearing will not take vegetation types below the 30% of the pre-clearing vegetation as recommended by ANZECC, 1999, National Framework for the Management and Monitoring of Australia's Native Vegetation. The National Objectives and Targets for Biodiversity Conservation 2001 - 2005 (Commonwealth of Australia 2001) also recognise 30% as the trigger value.

For the Perth Metropolitan Area and the Greater Bunbury Area the minimum retention figure is 10%.

VEGETATION CONDITION NOTES

The vegetation condition mapping used is that used by the Department of Environment and Conservation and is taken from Bush Forever 2000.

Vegetation Condition Scale reproduced from page 48 (Bush Forever 2000).

Condition Score	***Vegetation Condition***	***Vegetation Descriptors***
1	***Pristine***	*Pristine or nearly so, no obvious signs of disturbance*
2	***Excellent***	*Vegetation structure intact, disturbance affecting individual species, and weeds are non aggressive species.*
3	***Very Good***	*Vegetation structure altered, obvious signs of disturbance.* *For example disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.*
4	***Good***	*Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic structure or ability to regenerate it.* *For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.*
5	***Degraded***	*Basic structure of the vegetation severely impacted on by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.* *For example disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.*
6	***Completely Degraded***	*The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.*

This condition scale uses a scale that can distort the public perception of middle vegetation condition when compared to previous vegetation studies. In previous studies the word "Good" would have been a lower classification such as "Poor" as shown in Bush Forever 2000, page 48. The scale Good also does not seem to match the vegetation description provided on page 48. The Bush Forever 2000 Condition Score is possibly better related to the potential for regeneration of remnant vegetation rather than being a descriptor of its current condition. See Attachment 2.

Another approach is to use the number of remaining species as an indicator of vegetation condition. This provides for a less subjective assessment of the vegetation condition. Kaesehagen, 1995, Bushland Condition Mapping, IN Invasive Weeds and Regenerating Ecosystems in Western Australia, Proceedings of Conference held at Murdoch University, July 1994, Institute for Science and Technology Policy, Murdoch University, 1995, A copy of the Kaesehagen 1995 vegetation condition table is shown below.

Descriptor	***Percentage of species remaining***	***Comments***
Very Good - Excellent	***80 – 100%***	• *Vegetation structure intact or nearly so.* • *Cover / abundance of weeds less than 5%.* • *No or minimal signs of disturbance.*
Fair - Good	***50 – 80%***	• *Vegetation structure modified.* • *Cover / abundance of weed 5 – 20%, any number of individuals.* • *Minor signs of disturbance*
Poor	***20 – 50%***	• *Vegetation structure completely modified.* • *Cover / abundance of weeds 20 – 60% any number of individuals.* • *Disturbance incidence high*
Very Poor	***0 – 20%***	• *Vegetation structure disappeared.* • *Cover / abundance of weeds 60 – 100% cover, any number of individuals.* • *Disturbance incidence very high.*

CLEARING PRINCIPLES

Clearing is controlled under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. These regulations provide for a number of principles against which clearing is assessed.

	CLEARING PRINCIPLE *(Schedule 5 Environmental Protection Amendment Act, 1986*
1a	*High Level of diversity*
1b	*Significant fauna habitat*
1c	*Necessary to existence of Rare flora*
1d	*Threatened Ecological Community*
1e	*Significant area of vegetation in an area that has been extensively cleared*
1f	*Wetland or watercourse*
1g	*Land degradation*
1h	*Impact on adjacent or nearby conservation areas*
1i	*Deterioration of underground water*
1j	*Increase flooding*

The *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* also provide for planning and other policies and issues to be taken into account when determining clearing applications.

Section 51O of the *Environmental Protection Act 1986* allows the CEO to take planning matters into account when making clearing decisions, such as a State Planning Policy. There is an agreement between DEC and DMP permitting DMP to issue Clearing Permits.

As well as considering Biodiversity and other conservation issues the Clearing Principles that have to be satisfied are apparently designed for rural regions and do not adequately address the issues of resource needs. Therefore some additional principles need to be added when considering the need for essential Raw Materials. In an attempt to provide a better balance to the clearing principles those principles have been expanded as listed in the tables below.

	ADDITIONAL CLEARING PRINCIPLES – EXTRACTIVE INDUSTRIES
Environmental Protection Act 1984 Section 51O ***Planning Matters***	
1	*Planning Matters*
Environmental Protection Act 1984 Section 51O ***Relevant Matters***	
2a	*Need for the resource*
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2d	*Proposed final land use*
2e	*Offsite Environmental impacts if the resource is not used*
2f	*Sound environmental management and rehabilitation*

MEMORANDUM

TO: Chip Murray

FROM: Esperance Wildflower Society (Inc.)

DATE: May 3, 2000

SUBJECT: Vegetation survey

This report has been prepared in response to your request for a botanical survey of an area near Quallilup Lake intended for the purposes of mining lime sand.

The report addresses the associated criteria:

1 Geographic location.

2 Site ground data.

3 Vegetation structure and cover.

4 Vegetation condition.

5 Species present.

Contents

Introduction

This report is in response to a verbal request from Chip Murray to undertake a botanical survey of an area approximating 14ha, near the south eastern edge of Quallilup Lake which is south/south west of Dalyup and 35 km west of Esperance.

Five sections of descriptive information are provided on recording sheets. (see Appendices)

- There are two sections on sheet one, the first details the location of the site and includes a mud map with roads or distinguishing landmarks, a GPS reading and the topographic position.
- The second section contains site data relating to ground aspects and soil conditions. A photographic record was made in the form of video footage.
- Another two sections on the second recording sheet describe the vegetation structure and percentage cover as well as the dominant species, and the condition of vegetation.
- A complete species list of the various plant life forms found at the main survey site is recorded on the third sheet.
- Different plant species found on an adjacent rise to the south west of the main survey site are listed on a separate recording sheet.

Method

A series of five 20m x 20m quadrats was used at the main site, commencing from the lower slope on the northern end to just over the ridge. A narrow belt along the ridge was viewed to look for additional plant species not encountered in the quadrats.

Visual observation at the second site was for the purposes of plant identification only and the recording of different species.

The recording method was based on '*Bushland Plant Survey*', a Wildflower Society of WA (Inc.) Publication.

Vegetation

At the first site, the plant species identified were found to be relatively common and dominant in each quadrat, from the lower slope on the northern aspect up to the southern aspect of the ridge. Different variations of plant associations occurred with lower plant height on the lower slope and taller vegetation along the ridge. Further variations of plant communities were found in the fifth quadrat and some different species along the ridge.

Similar plant associations were found at the second site. However, some entirely different plant species were also discovered. The vegetation at this site was observed generally as Dense Low Heath on the southern and northern aspects, with Very Open Herbs on the eastern perimeter.

Muir's[1] classification of vegetation was used for the description of each quadrat at Site 1 as follows:

1) Dense Low Heath >1.0m, over Open Low Sedges, over Very Open Mosses.
2) Open Low Scrub 1.5-2.0m, over Low Heath >1.0m, over Very Open Low Sedges, over Very Open Mosses.
3) Open Scrub exceeding 2.0m, over Open Low Scrub 1.0-2.0m, over Low Heath > 1.0m, over Very Open Herbs, over Open Low Sedges and Very Open Mosses.
4) Open Scrub exceeding 2m, over Open Low Scrub 1.0-2.0m, over Low Heath > 1.0m, over Very Open Herbs, over Open Low Sedges and Very Open Mosses.
5) Open Scrub exceeding 2m, over Heath 1.0-2.0m, over Dwarf scrub >1.0m, over Very Open Herbs, over Open Low Sedges and Very Open Mosses.

Flora

A total of 41 species from 26 plant families are listed on the third recording sheet. An inventory of the plant families is also included in the Appendices.

There are no recorded Declared Rare Flora or Priority species known at the site (Coyne 2000). None were observed whilst undertaking recording activities in the areas surveyed.

Only two introduced weed species, in the plant family Poaceae, were detected – the grasses, Sweet Vernal Grass and Perennial Veldt Grass.

It was difficult to determine purely by observations made during the survey, for any dead plants of which the cause could be likely attributed to dieback (*Phythophthora sp.*). This was due to the lack of suitable susceptible indicator species. No soil samples were taken for testing by the Esperance Wildflower Society. Inquiries at the Esperance Department of Conservation and Land Management offices revealed no further information.

Summary

Our observations and recordings in the field of the vast number of flowering and seed bearing plants, and the extent of natural regeneration, suggests to us that the majority of the vegetation and the overall site is in very good to excellent condition. The lack of weed invasion and general stable nature of the site supports this.

Future Monitoring and Evaluation

At the request of Mr Chip Murray, the Esperance Wildflower Society has agreed to undertake a series of site visits over the life of the proposed project for the purposes of monitoring and evaluating regeneration of the site. Suitable timeframes will be determined sometime after the commencement of the project and all necessary criteria will be conformed to as required by the relevant authorities.

Acknowledgments

The Esperance CALM Regional Herbarium resources, in conjunction with the WA Herbarium, were used for identification purposes.

Notes

1 Muir, B. G., 1977: *Records of the Western Australian Museum, Supplement No. 3.*

References

Blackall, W. E., & Grieve, B.J., *How to Know Western Australian Wildflowers,* Part IIIB, UWA Press, Western Australia, 1981.

Coyne, L. 2000. Wildlife Officer, Department of Conservation and Land Management. Esperance Western Australia.

Grieve, B. J., *How to Know Western Australian Wildflowers*, Part II Second Edition, UWA Press, Western Australia, 1998.

Keighery, Bronwen, *Bushland Plant Survey,* Wildflower Society of WA (Inc.) Publication, September 1994.

Meney, Kathy, & Pate, John, *Australian Rushes,* UWA Press, Western Australia, 1999.

APPENDIX A

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESENCE Label each plant with plants number, site code, date and plant's name or working name if required

SITE No. 1	
Date 10 March 2000	
Latitude:	**33 49' .36 S**
Longitude:	**121 31' .25 E**

Record on sheet

- **Column 1** plant name
- **Column 2** plant name
- **Column 3** flowering time - TICK if species flowering
- **Column 4** identification check

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64, Nedlands WA 6008

TREES	No	Fl	ID
MALLEES			
SHRUBS			
Acacia cyclops	33	✓	
Acacia rostellifera	4		
Clematis pubescens	NC		
Comesperma virgatum	27	✓	
Grevillea pauciflora	6	✓	
Hakea nitida	20		
Lasiopetalum discolor	36	old	
Leucopogon parviflorus	19		
Leucopogon obovatus	24		
Leucopogon sp (broadly ovate leaf)	9		
Leucopogon sp (revolute leaf)	5	✓	
Logania fasciculata	12	&ud	
Melaleuca pentagona	1		
Olearia axillaris	18	✓	
Phyllanthus calycinus	25		
Pimelea ferruginea	34	✓	
Pomaderris myrtilloides	10	✓	
Pultenaea obcordata	11	✓	
Rhagodia preissii	22		

SHRUBS (cont.)	No	Fl	ID
Senecio lautus subsp maritimus	17		
Sollya heterophylla	2	✓	
Spyridium globulosum	23	✓	
Templetonia retusa	43		
GRASSES			
**Anthoxanthum odoratum*	14		
**Ehrharta calycina*	21		
HERBS			
Brachyscome ciliaris	29	✓	
Cassytha racemosa	35	✓	
Clematis linearifolia	30		
Clematis pubescens (seedlings)	26		
Dianella revoluta	15	very old	
Goodenia filiformis	32	✓	
Hibbertia racemosa	31		

HERBS (cont.)	No	Fl	ID
SEDGES			
Desmocladus flexuosus	8		
Gahnia sp	16	✓	
Lepidosperma squamatum	28	✓	
FUNGI			
Bracket fungi	NC		
LICHENS / MOSS			
Thready lichens in small bunches	NC		
Surface moss in patches	NC		

(Numbers missing from sequence are duplicates of specimens identified)

APPENDIX B

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESENCE Label each plant with plants number, site code, date and plant's name or working name if required

SITE No 2
Date 10 March 2000
Latitude: 33 49' .41 S
Longitude: 121 31' .16 E

Record on sheet
- Column 1 plant name
- Column 2 plant name
- Column 3 flowering time - TICK if species flowering
- Column 4 identification check

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64, Nedlands WA 6008

TREES	No	Fl	ID	SHRUBS (cont.)	No	Fl	ID	HERBS (cont.)	No	Fl	ID
MALLEES											
				GRASSES							
SHRUBS											
Same common species / older											
Also:								SEDGES			
Acacia cochlearis	NC							*Gahnia sp*	NC		
Comesperma virgatum	37	√						*Lepidosperma squamatum*	NC		
Melaleuca pulchella	39	√						*Lomandra micranths ssp teretifolia*	40		
Pimelea ferruginea	NC	√									
Rhadinothamnus rudis	41	√		HERBS							
				Goodenia filiformis	32	√					
				Goodenia tripartita	NC	√					
				Patersonia sp.	38	old					
				Stylidium pilosum	42	very old					

(Numbers missing from sequence are duplicates of specimens identified)

FLORA INVENTORY - 26 Plant families - 41 Plant species

Poaceae
**Anthoxanthum odoratum*
**Ehrharta calycina*

Cyperaceae
Gahnia sp
Lepidosperma squamatum

Restionaceae
Desmocladus flexuosus

Dasypogonaceae
Lomandra micrantha subsp teretifolia

Phormiaceae
Dianella revoluta subsp brevicaulis

Iridaceae
Patersonia sp

Proteaceae
Grevillea pauciflora
Hakea nitida

Chenopodiaceae
Rhagodia preissii

Ranunculaceae
Clematis linearifolia
Clematis pubescens

Lauraceae
Cassytha racemosa

Pittosporaceae
Sollya heterophylla

Mimosaceae
Acacia cochlearis
Acacia cyclops
Acacia rostellifera

Papilionaceae
Pultenaea obcordata
Templetonia retusa

Rutaceae
Rhadinothamnus rudis

Polygalaceae
Comesperma virgatum

Euphorbiaceae
Phyllanthus calycinus

Rhamnaceae
Pomaderris myrtilloides
Spyridium globulosum

Sterculiaceae
Lasiopetalum discolor

Dilleniaceae
Hibbertia racemosa

Thymelaceae
Pimelea ferruginea

Myrtaceae
Melaleuca pentagona
Melaleuca pulchella

Epacridaceae
Leucopogon obovatus
Leucopogon parviflorus
Leucopogon sp
Leucopogon sp

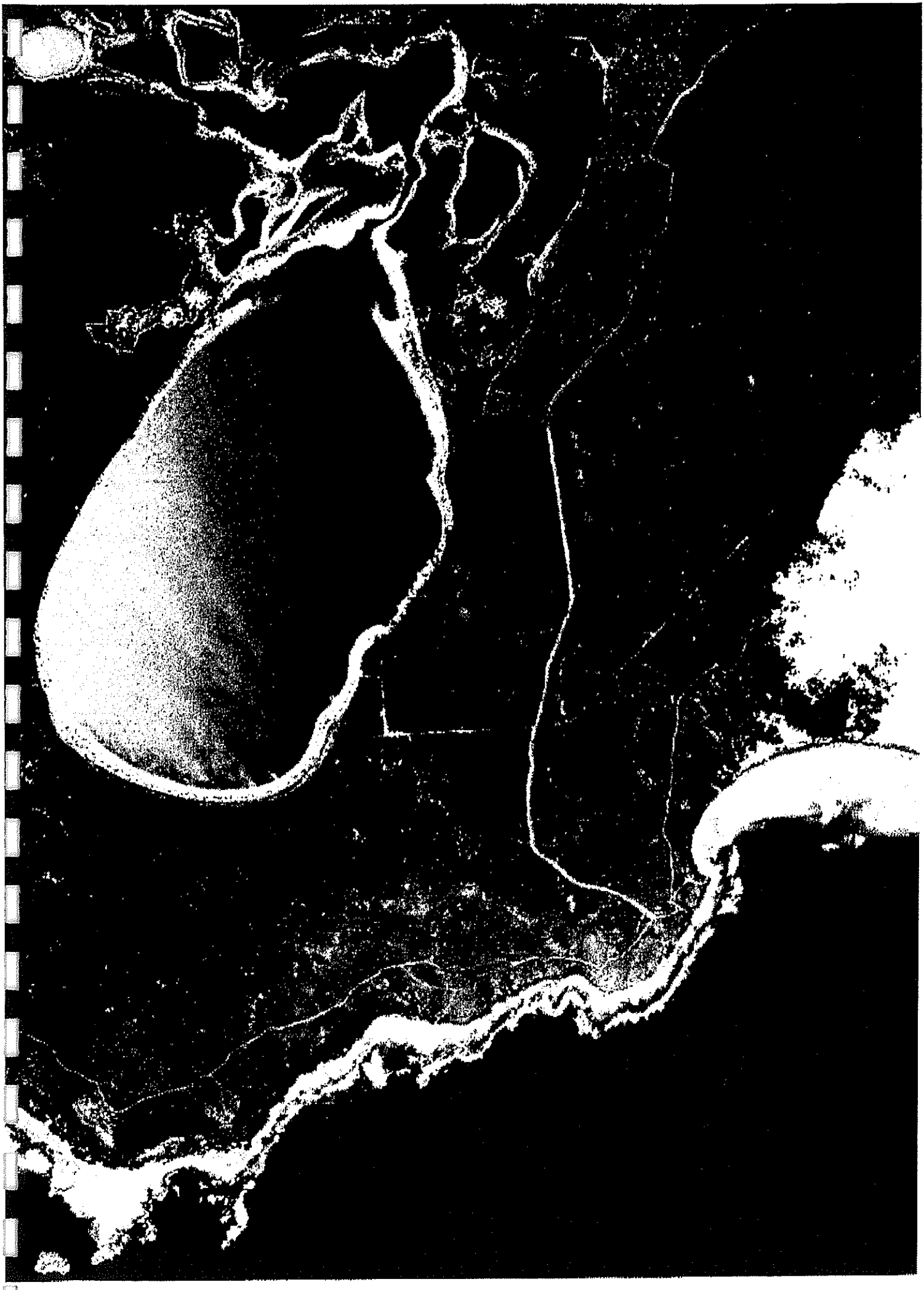
Loganiaceae
Logania fasciculata

Goodeniaceae
Goodenia filiformis
Goodenia tripartita

Stylidiaceae
Stylidium pilosum

Asteraceae
Brachyscome ciliaris
Olearia axillaris
Senecio lautus subsp maritimus

* = Introduced species



BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA Quallilup Lake SITE NUMBER 1 / quadrat 1

DATE TRIP 10/3/00 RECORDERS Volker Mischker, Angela Alderman

DATE TRIP _____ RECORDERS _____

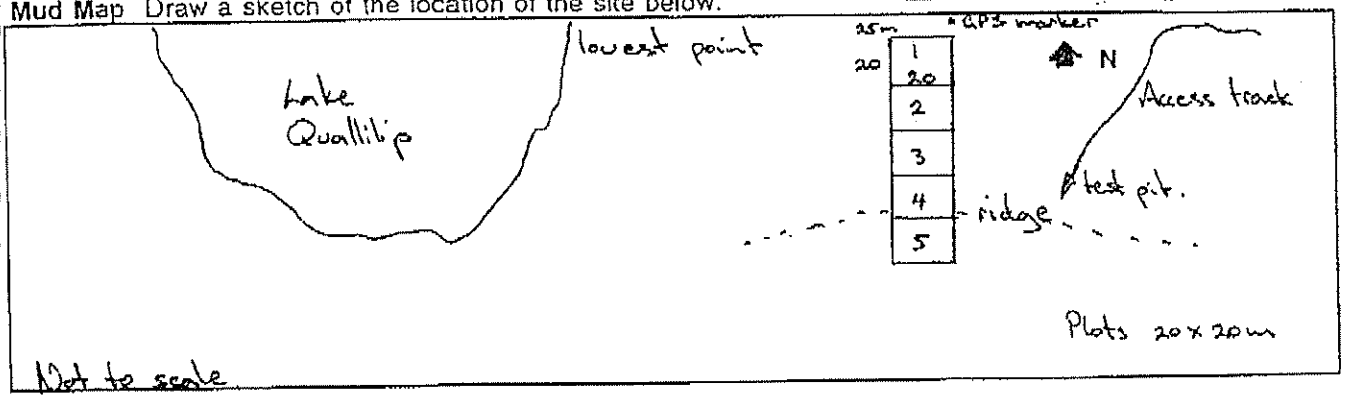
DATE TRIP _____ RECORDERS _____

BOTANIST _____

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.



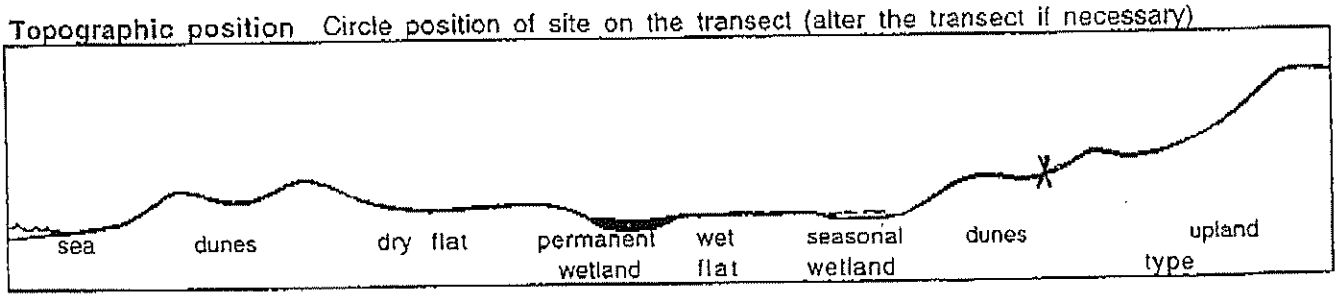
Road Location Access via Murrays Rd (T & J Murray's Property)

Geographic Location Latitude 33 49'. 36 S Longitude 121 31'. 25 E Altitude

Reference Map

Photograph Photographer's Name Photo No

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope flat (gentle) steep ~3% *Aspect* (N) NE E SE S SW W NW

Surface Soil SAND *Colour* GREY

Exposed rock *type* % surface 2-10

Sub-surface Soil LIMESTONE *Colour* WHITE

Rock *type* depth to rock < 10 cm

Drainage (well) mod poor depth water cm *Wet* all year winter/spring

Litter >70% % cover *Bare Ground* 2 %cover

Depth 1-2 cm

Quadrat 1

BUSHLAND PLANT SURVEY RECORDING SHEET 2 - use pencil only

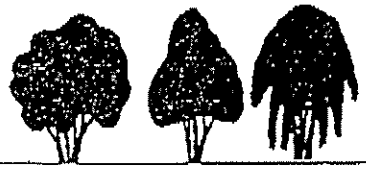
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below) and dominant species in each layer.

Cover Class: 2-10% | 10-30% | 30 - 70% | over 70%

	TREES			MALLEES	
	over 30m	10 - 30m	under 10m	over 8m	under 8m
LIFE FORM					 30m 10m
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS		SHRUBS
	over 2m	2m - 1m	under 1m
LIFE FORM			dense low heath c/o 2m 1m 
COVER CLASS (%)			> 70%
DOMINANT SPECIES			Leucopogon Melaleuca pentagona Pultenaea

	GRASSES	HERBS	SEDGES	OTHER
LIFE FORM			open low 	very open mosses 1m
COVER CLASS (%)			10 - 30%	2 - 10%
DOMINANT SPECIES			Gahnia Desmocladus	moss lichen

4. VEGETATION CONDITION

'PRISTINE'	
EXCELLENT	✓
3 VERY GOOD	
GOOD	
5 DEGRADED	

COMMENTS

- Fresh & old roo scats
- obvious dead wood on M. pentagona
- regeneration of shrubs evident.

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA Quallilup Lake SITE NUMBER 1/ Quadrat 2
DATE TRIP 10/3/2000 RECORDERS Volker Mischker, Angela Anderman
DATE TRIP _____ RECORDERS _____
DATE TRIP _____ RECORDERS _____
BOTANIST _____

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.

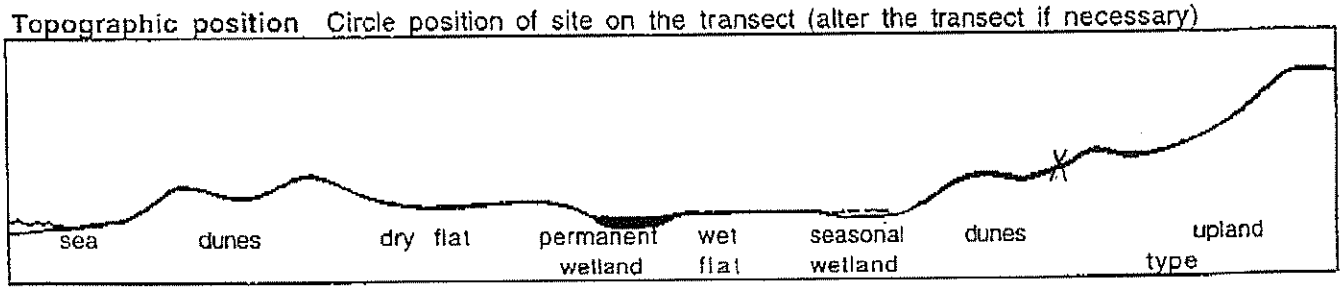
N

Road Location Access via Murray Rd (T & J Murray's Property)

Geographic Location Latitude S Longitude E Altitude
Reference Map

Photograph Photographer's Name Photo No

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope flat (gentle) steep 4% *Aspect* (N) NE E SE S SW W NW

Surface Soil Sand *Colour* Grey
Exposed rock *type* Limestone % surface 10-30

Sub-surface Soil Limestone *Colour* White
Rock *type* depth to rock <10 cm

Drainage (well) mod poor depth water cm *Wet* all year winter/spring

Litter >70 % cover
Depth 1-2 cm

Bare Ground 10-30 %cover

Quadrat 2

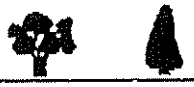
BUSHLAND PLANT SURVEY RECORDING SHEET 2 - use pencil only

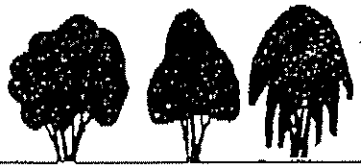
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

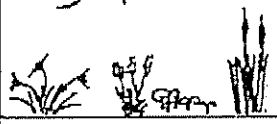
3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below),and dominant species in each layer.

Cover Class 2-10% 10-30% 30 - 70% over 70%

	TREES			MALLEES	
	over 30m	10 - 30m	under 10m	over 8m	under 8m
LIFE FORM					 30m 10m
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS		SHRUBS
	over 2m	2m - 1m	under 1m
LIFE FORM		open low scrub A 	low heath C/D  2m 1m
COVER CLASS (%)		2-10 %	30-70 %
DOMINANT SPECIES		Acacia cyclops	Melaleuca pentagona Pultenaea Leucopogon

	GRASSES	HERBS	SEDGES	OTHER
LIFE FORM			very open low 	very open mosses 1m
COVER CLASS (%)			2-10 %	2-10
DOMINANT SPECIES			Gahnia	moss lichen

4. VEGETATION CONDITION

		COMMENTS
1 'PRISTINE'		- Fresh roo scats
2 EXCELLENT		• Increase in dead M. pentagona
3 VERY GOOD	✓	• regeneration of shrubs evident
4 GOOD		• lot more limestone on surface.
5 DEGRADED		

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA Quallilup Lake SITE NUMBER 1/ Quadrat 3

DATE TRIP 10/3/2002 RECORDERS Volker Mischker, Angela Anderman

DATE TRIP _____ RECORDERS _____

DATE TRIP _____ RECORDERS _____

BOTANIST _____

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.). PO Box 64 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.

N

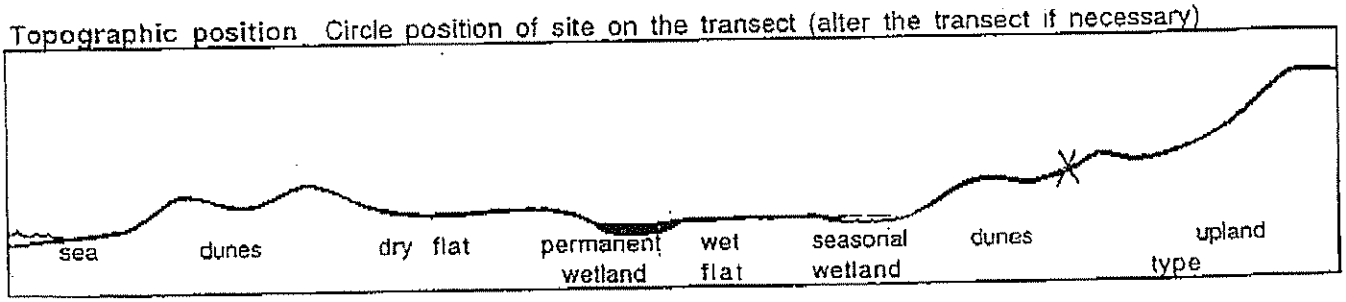
Road Location Access via Murray's Road (T & J Murray's Property)

Geographic Location Latitude S Longitude E Altitude

Reference Map

Photograph / Photographer's Name Photo No

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope flat (gentle) steep 4-5% *Aspect* (N) NE E SE S SW W NW

Surface Soil Sand *Colour* Grey

Exposed rock *type* Limestone % surface 10-30

Sub-surface Soil Limestone *Colour* White

Rock *type* depth to rock < 10 cm

Drainage (well) mod poor depth water cm *Wet* all year winter/spring

Litter 30-70 % cover	*Bare Ground* 10-30 %cover
Depth 1 cm	

Quadrat 3

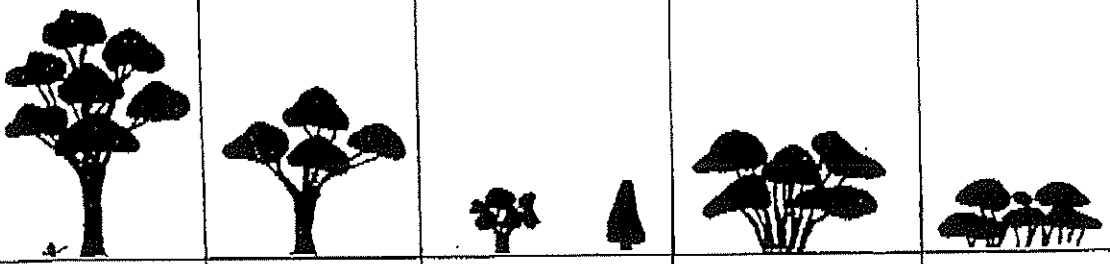
BUSHLAND PLANT SURVEY RECORDING SHEET 2 - use pencil only

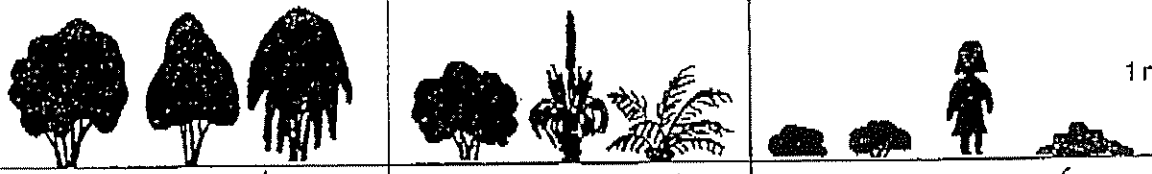
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.). PO Box 64 Nedlands WA 6008.

3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below), and dominant species in each layer.

Cover Class: 2-10% | 10-30% | 30 - 70% | over 70%

	TREES			MALLEES	
	over 30m	10 - 30m	under 10m	over 8m	under 8m
LIFE FORM					
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS		SHRUBS
	over 2m	2m - 1m	under 1m
LIFE FORM			
COVER CLASS (%)	2-10 %	2-10 %	30-70 %
DOMINANT SPECIES	Acacia cyclops	Spyridium globulosum	Melaleuca pentagona Pultenaea Pomaderris

	GRASSES	HERBS	SEDGES	OTHER
LIFE FORM		 very open	 open low sedges	very open mosses 1m
COVER CLASS (%)		2-10 %	10-30 %	2-10 %
DOMINANT SPECIES		Goodenia Dianella Cassytha	Gahnia	Moss Lichen

4. VEGETATION CONDITION

1 'PRISTINE'		COMMENTS • Older roo scats • regeneration of shrubs evident. • Some dead M. pentagona
2 EXCELLENT		
3 VERY GOOD	✓	
4 GOOD		
5 DEGRADED		

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA Quallilop Lake SITE NUMBER 1/ Quadrat 4

DATE TRIP 10/3/2000 RECORDERS Volker Mischker, Angela Ackerman

DATE TRIP _____ RECORDERS _____

DATE TRIP _____ RECORDERS _____

BOTANIST _____

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.

N

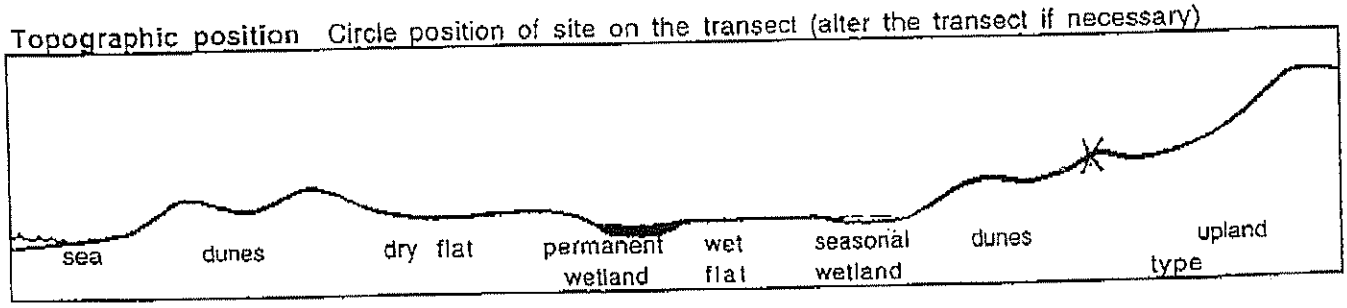
Road Location Access via Murray's Rd (T & J Murray's Property)

Geographic Location Latitude _____ S Longitude _____ E Altitude _____

Reference Map

Photograph Photographer's Name _____ Photo No _____

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope flat (gentle) steep 3% *Aspect* (N) NE E SE S SW W NW

Surface Soil Sand *Colour* Grey

Exposed rock *type* Limestone % surface 10-30%

Sub-surface Soil Limestone *Colour* White

Rock *type* _____ depth to rock < 10 cm

Drainage (well) mod poor depth water _____ cm *Wet* all year winter/spring

Litter 30-70 % cover Depth 1 cm

Bare Ground 10-30 %cover

Quadrat 4

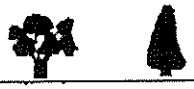
BUSHLAND PLANT SURVEY RECORDING SHEET 2 - use pencil only

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.). PO Box 64 Nedlands WA 6008.

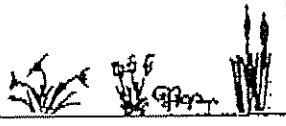
3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below).and dominant species in each layer.

Cover Class 2-10% 10-30% 30 - 70% over 70%

	TREES			MALLEES	
	over 30m	10 - 30m	under 10m	over 8m	under 8m
LIFE FORM					 30m 10m
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS		SHRUBS
	over 2m	2m - 1m	under 1m
LIFE FORM	open scrub 	open low scrub A/B 	low health c/D 2m 1m 
COVER CLASS (%)	2-10%	2-10%	30-70%
DOMINANT SPECIES	Acacia cyclops	Spyridium globulosum	Melaleuca pentagona Pultenaea Pomaderris

	GRASSES	HERBS	SEDGES	OTHER
LIFE FORM		very open 	open low sedges 	very open mosses 1m
COVER CLASS (%)		2-10%	10-30%	2-10%
DOMINANT SPECIES		Dianella Cassytha	Gahnia	Moss Lichen

4. VEGETATION CONDITION

1	'PRISTINE'	
2	EXCELLENT	
3	VERY GOOD	✓
4	GOOD	
5	DEGRADED	

COMMENTS
- This quadrat has been partly cleared & dug up (≈50%)
- Some dead M. pentagona
- fresh roo scats
- regeneration of shrubs evident.

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA Quallilup Lake SITE NUMBER 1 / Quadrat 5
DATE TRIP 10/3/2000 RECORDERS Volker Mischker, Angela Aldermann
DATE TRIP ____ RECORDERS ____
DATE TRIP ____ RECORDERS ____
BOTANIST ____

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc), PO Box 64 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.

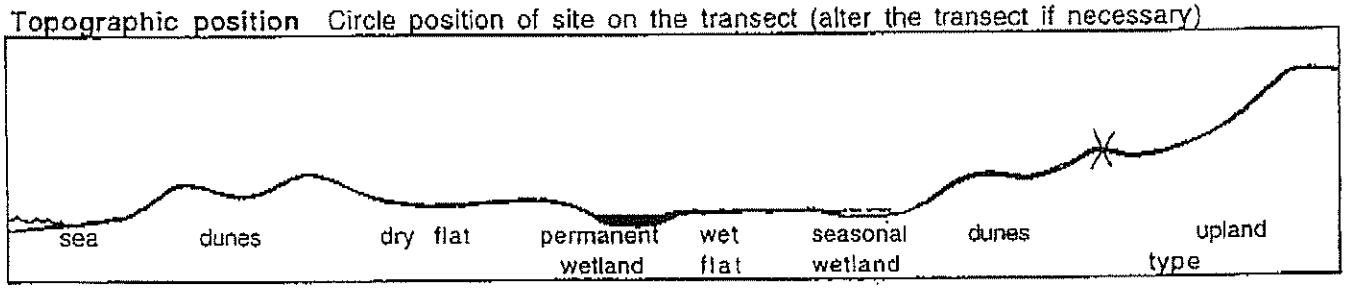
N

Road Location Access via Murray's Rd (T & J Murray's Property)

Geographic Location Latitude S Longitude E Altitude
Reference Map

Photograph Photographer's Name Photo No

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

slight slope to S

Slope (flat) gentle steep *Aspect* N NE E SE (S) SW W NW

Surface Soil Sand *Colour* Grey
Exposed rock *type* Limestone % surface 2-10%

Sub-surface Soil Limestone *Colour* White
Rock *type* depth to rock

Drainage (well) mod poor depth water cm *Wet* all year winter/spring

Litter	>70 % cover	*Bare Ground*	2-10 %cover
Depth	1-2 cm		

Quadrat 5

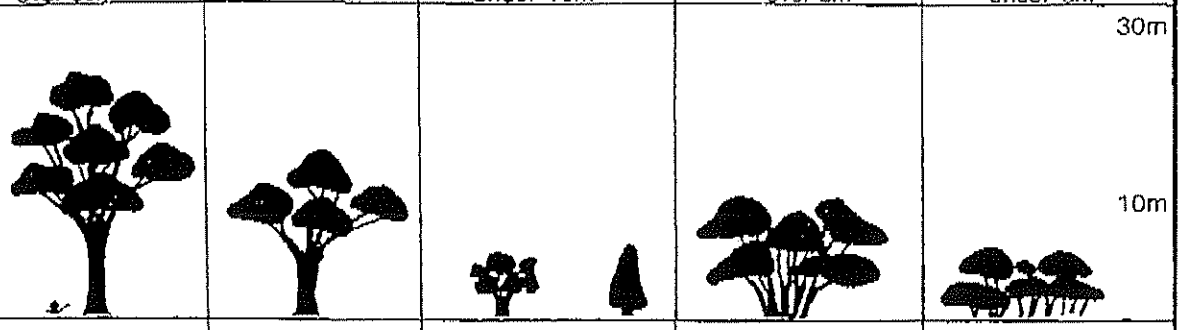
BUSHLAND PLANT SURVEY RECORDING SHEET 2 - use pencil only

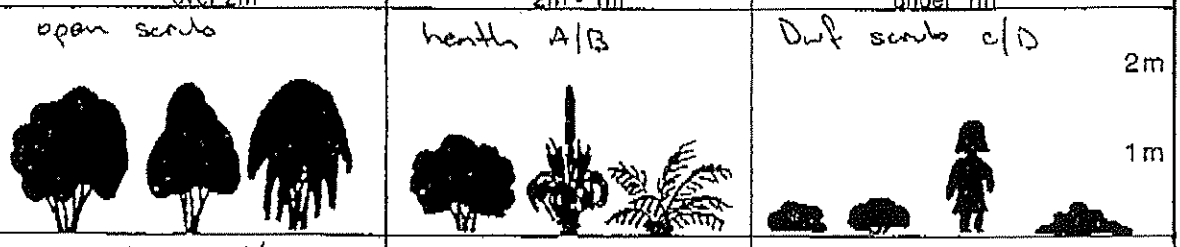
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

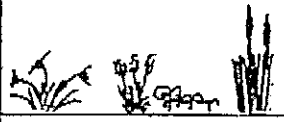
3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below).and dominant species in each layer.

Cover Class	2-10%	10-30%	30 - 70%	over 70%

	TREES			MALLEES	
	over 30m	10 - 30m	under 10m	over 8m	under 8m
LIFE FORM					
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS over 2m	SHRUBS 2m - 1m	SHRUBS under 1m
LIFE FORM			
COVER CLASS (%)	2-10%	30-70%	10-30%
DOMINANT SPECIES	Acacia cyclops	Seycidium globulosum Melaleuca pentagona Leucopogon parviflorum	Pritenacea Lonaderris Acacia rostulata

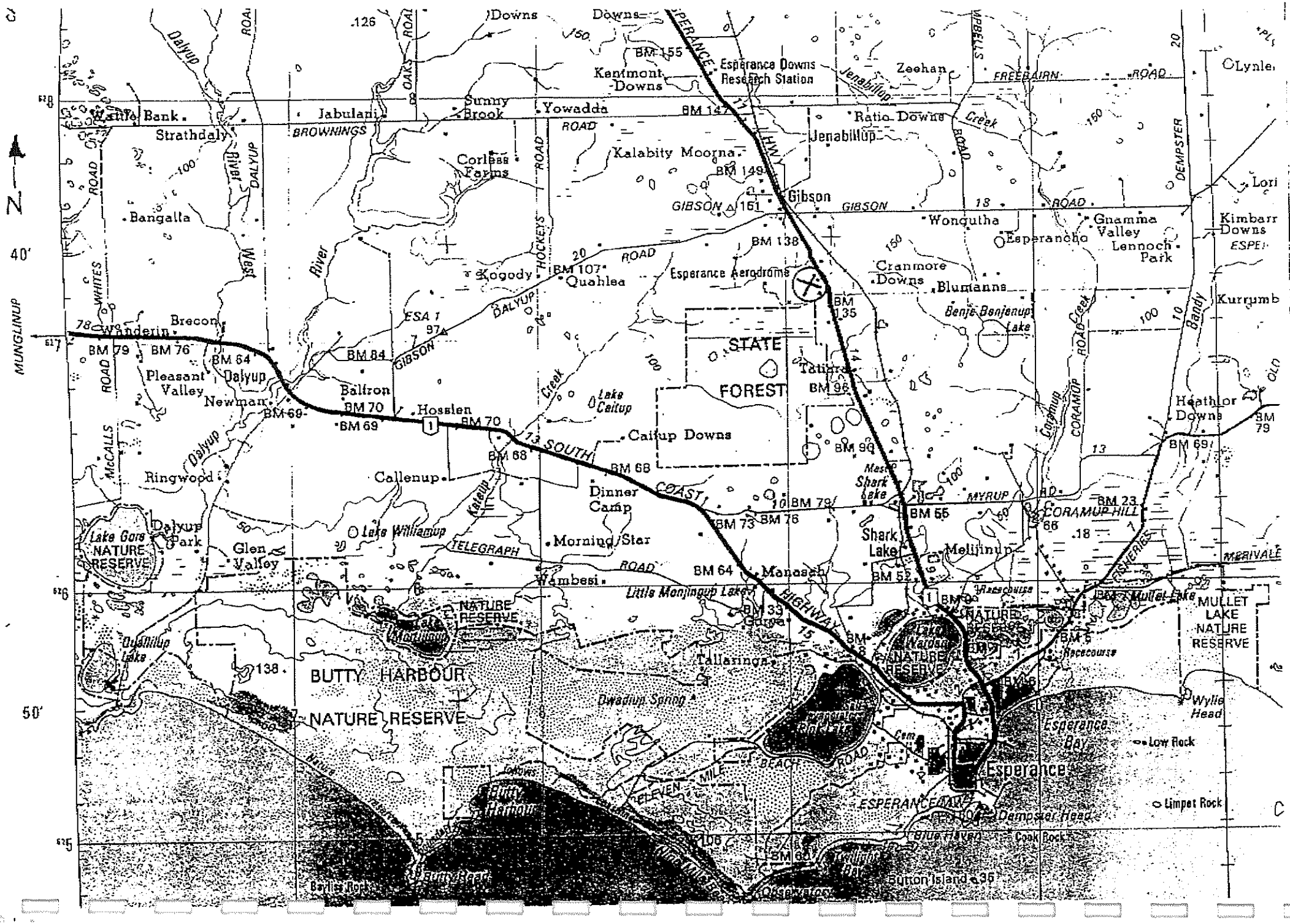
	GRASSES	HERBS	SEDGES	OTHER
LIFE FORM				
COVER CLASS (%)		2-10%	10-30%	2-10%
DOMINANT SPECIES		Dianella	Gahnia Desmocladus	Lichen

4. VEGETATION CONDITION

1 'PRISTINE'	
2 EXCELLENT	
3 VERY GOOD	✓
4 GOOD	
5 DEGRADED	

COMMENTS

- old roo scats
- large dead M. pentagona, Hakea nitida
- regeneration of shrubs evident
- older plant community with some dying or dead.

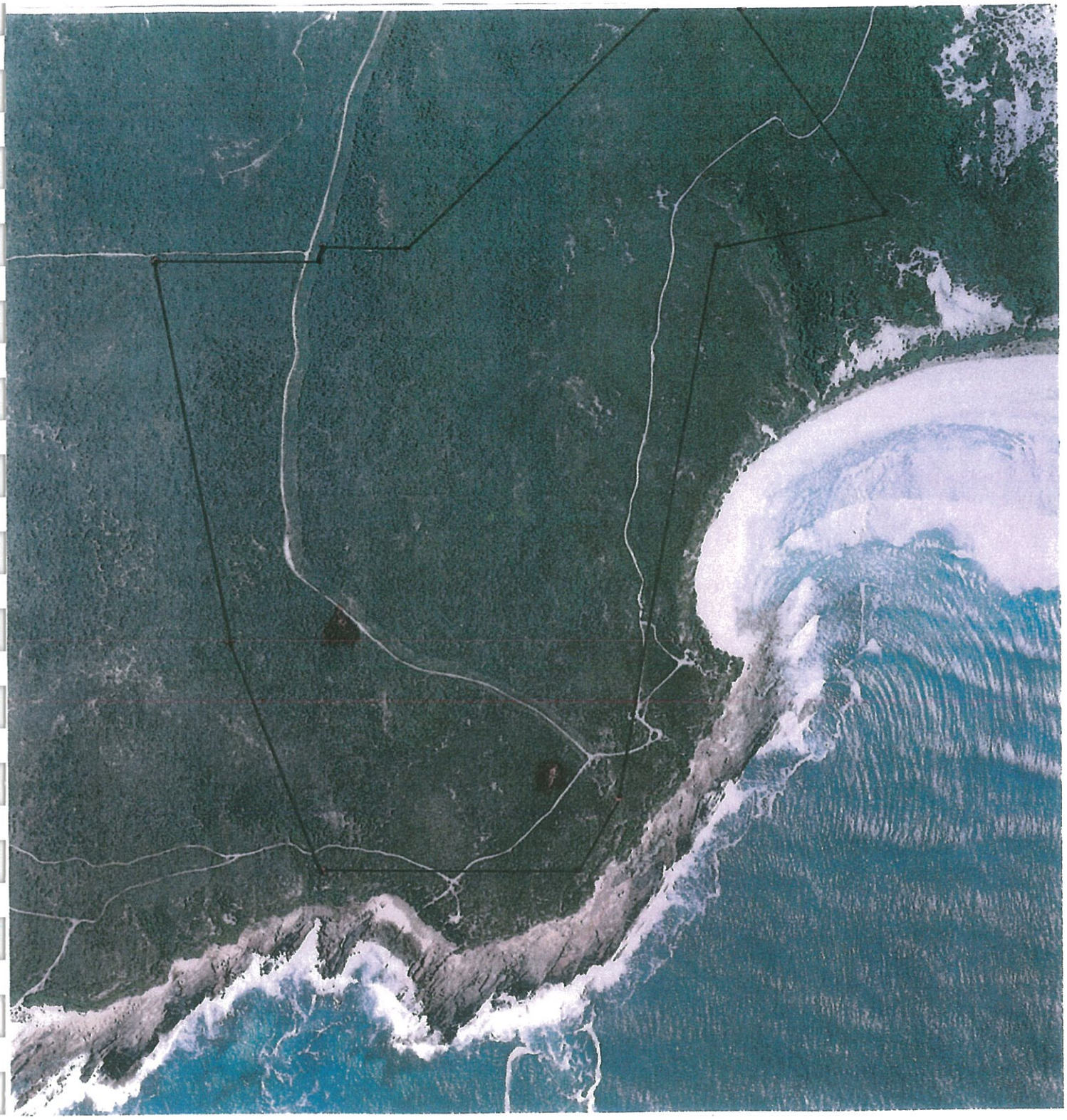


Quallilup Vegetation Report

Prepared for N D Murray
By

Esperance Wildflower Society (Inc)
March 2009

Contents



Site 1

Site 2

Vegetation Report for proposed second Quallilup site

TO: Chip Murray

FROM: Esperance Wildflower Society (Inc)

DATE: March 2009

SUBJECT: Vegetation Report at location indicated on aerial photo provided.

This report has been prepared in response to your request for a flora list of an area shown on the aerial photo provided, for the purpose of mining lime sand.

The first site visit was made with you in October 2008, traversing a broad area within the designated polygon, when many species were flowering. A comprehensive list was compiled to accompany the photos taken at that time, on the understanding that we could not proceed with the report until 2009.

A follow up site visit in April 2009 was conducted to finalise the specific site data at two focal points within the polygon of the defined survey area.

The flora descriptions refer to:-

- Site 1 - elevated areas of shallow soil over rocky limestone near the coast.
- Site 2 - low lying areas of shrub mallee and heath on sandy soil further inland.

See Appendix A: Recording sheets of each site.

Appendix B: The Plant Inventory lists 98 species within 39 plant families from an extended area surrounding the 2 studied sites. NB: Weed species are indicated thus *

Several healthy plants of a Priority 3 taxon *Leucopogon rotundifolius* were detected in the survey site of elevated coastal heath, recorded a Site 1.

The vegetation on the exposed elevated coastal section is mostly intact, due to wind pruning and shallow soil, whereas the more sheltered areas lower down support many of the same species in taller shrub forms and with an understorey of small herbaceous plants and orchids.

The general condition of the area is very good apart from the lower site immediately adjacent to the track, which has a previous history of disturbance in places and subsequently there is some weed presence. The 8 weed species are recorded in site 2.

There is a population of a serious environmental weed *Gomphocarpus fruticosus* (Narrow-leaf Cotton Bush) and a single plant of the introduced species *Melaleuca armillaris* (Bracelet Honey Myrtle) along the track north of the existing mine site.

Narrow-leaf Cotton Bush is a Declared Plant species requiring the landholder to carefully remove and destroy all fruiting bodies in situ then remove all the plants. The area should be monitored for several years as small plants will continue to regenerate from seeds dispersed in recent years.

An associate from Esperance Bird Observers Group was present when we visited the area in April and provided the enclosed Appendix C, listing 12 bird species present on the day.

Appendix A

Survey forms for Sites 1 & 2

BUSHLAND PLANT SURVEY RECORDING SHEET 1 - use pencil only

BUSHLAND AREA: Quallilup **SITE NUMBER 1**

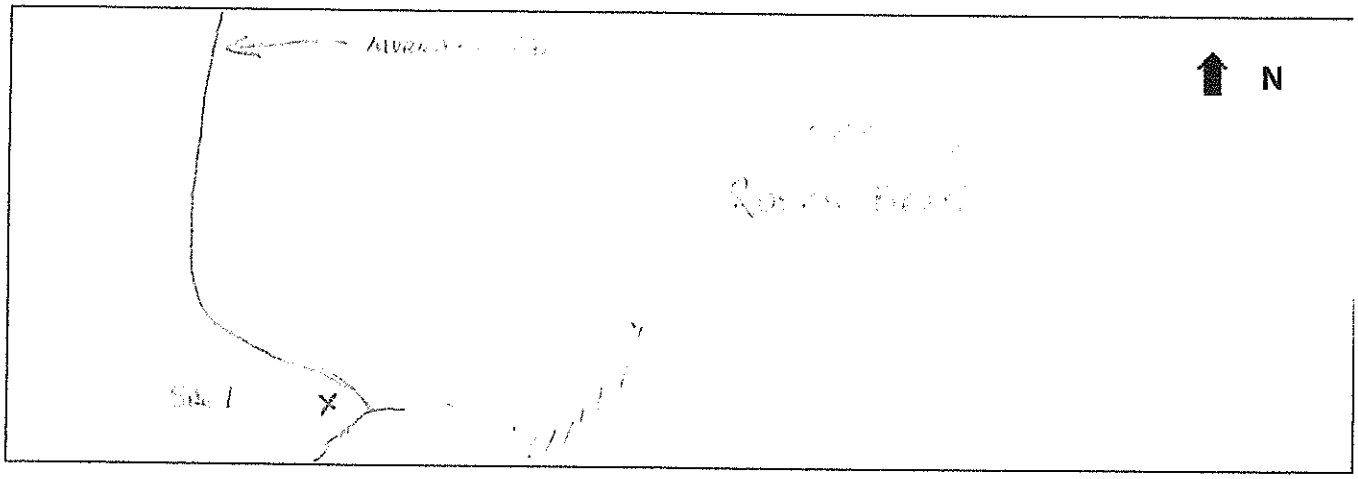
DATE TRIP: 24th APRIL 2009 **RECORDERS:** Mary Hoggart B.Sc.,

BOTANIST: Coral Turley

1. LOCATION of the QUADRAT

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64, Nedlands WA 6008

Mud Map Draw a sketch of the location of the site below.

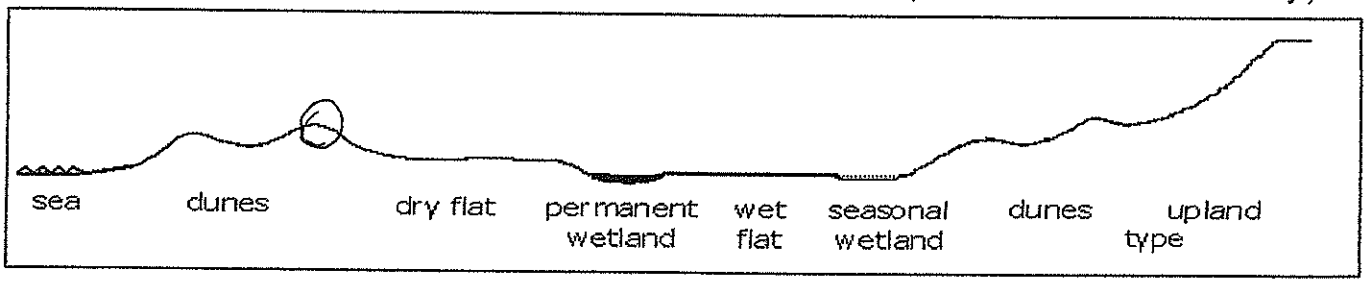


Road Location Track extending south from Murrays Rd SE of Lake Quallilup

Geographic Location Latitude 33° 49' 49" S Longitude 121° 31' 33"E Altitude 35m
Reference Map Aerial photograph provided

Photograph Photographer's Name Coral Turley

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope flat (gentle) steep ***Aspect*** N NE E (SE) (S) SW W NW

Surface soil Shallow sand over limestone ***Colour*** grey / brown
Exposed rock ✓ ***type*** Limestone **2** % surface

Sub-surface Soil Limestone ***Colour*** white
Rock ✓ ***type*** Limestone depth to rock shallow

Drainage (well) mod poor depth water cm ***Wet*** all year winter/spring

Litter	95% cover	***Bare Ground***	2% cover
Depth	0.5cm		

BUSHLAND PLANT SURVEY RECORDING SHEET 2 - use pencil only

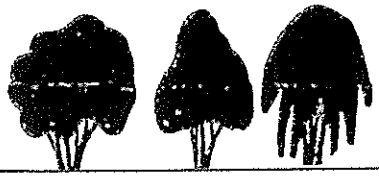
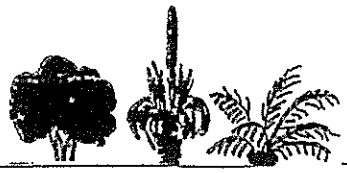
From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc), PO Box 64 Nedlands WA 6008

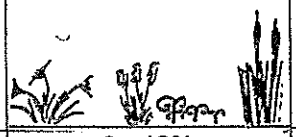
3. VEGETATION STRUCTURE AND COVER

For each layer **record** – appropriate **life form, cover class** (see below) and **dominant species** in each layer.

Cover Class	2 – 10%	10 – 30%	30 – 70%	over 70%

	TREES			MALLEES	
	over 30m	10 – 30m	under 10m	over 8m	under 8m
LIFE FORM					 10r
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS		SHRUBS
	over 2m	2m – 1m	up to 1m
LIFE FORM			 2 1
COVER CLASS (%)			over 70%
DOMINANT SPECIES			*Melaleuca pentagona / latifolia* *Acacia cochlearis* *Pomaderris myrtilloides*

	GRASSES	HERBS	SEDGES	OTHER
LIFE FORM				
COVER CLASS (%)	2%		2 - 10%	
DOMINANT SPECIES	*Austrodanthonia caespitosa*		*Lepidosperma gladiatum* *Desmocladus flexuosus* Small sterile sedge	

4. VEGETATION CONDITION

	✓
1 'PRISTINE'	
2 EXCELLENT	
3 VERY GOOD	
4 GOOD	
5 DEGRADED	

COMMENTS

Very stunted, wind-blasted vegetation due to exposed coastal site.
Occasional clumps of moss noted on soil surface.

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESENCE Label each plant with plant's number, site code, date and plant's name or working name if required

SITE 1 QUALLILUP
Date 24th April 2009

Record on sheet
- **Column 1** plant name
- **Column 2** plant number
- **Column 3** flowering time - TICK if species flowering
- **Column 4** identification check

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64, Nedlands WA 6008

TREES	No	Fl	ID
MALLEES			
SHRUBS			
Melaleuca lanceolata	1		
Melaleuca pentagona subsp *latifolia*	2		
Acacia cochlearis	3		
Acacia cyclops	4	✓	
Melaleuca pulchella	5		
Spyridium globulosum	6	✓	
Scaevola crassifolia	7		
Olearia axillaris	8	✓	
Pomaderris myrtilloides	9	✓	
Rhadinothamnus rudis subsp *rudis*	10	✓	
Nematolepis phebalioides	11	✓	
Pultenaea quaerita	12	✓	
Leucopogon pleurandroides	13	✓	
Leucopogon rotundifolius	14		
Westringia dampieri	15		
Pimelea ferruginea	16		
Lasiopetalum discolor	17	✓	
Logania fasciculata	18	✓	

SHRUBS (cont.)	No	Fl	ID
GRASSES			
Austrodanthonia sp sterile	19		
Austrostipa sp sterile	20		
HERBS			
Eriochilus dilatatus	21	✓	
Cassytha sp	22		
Phyllanthus calycinus	23		
Billardiera coriacea	24		
Podolepis rugata	25	✓	

HERBS (Cont'd)	No	Fl	ID
SEDGES			
Sedge erect small - fine terete leaf	26	✓	
Lepidosperma gladiatum	27	✓	

BUSHLAND PLANT SURVEY RECORDING SHEET 1 - use pencil only

BUSHLAND AREA: Quallilup **SITE NUMBER 2**

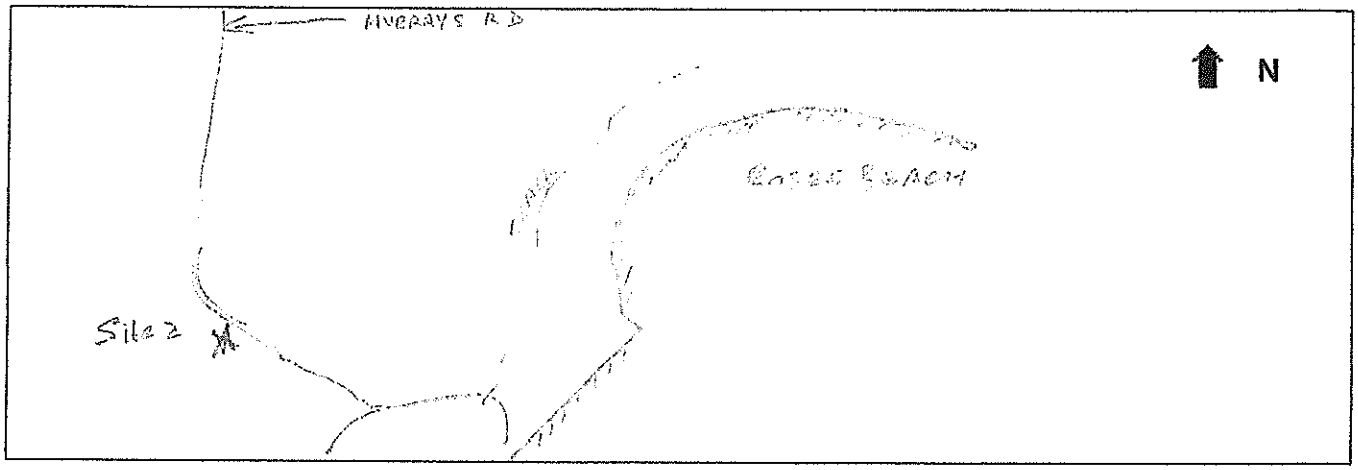
DATE TRIP: 24th APRIL 2009 **RECORDERS:** Mary Hoggart B.Sc.,

BOTANIST: Coral Turley

1. LOCATION of the QUADRAT

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64, Nedlands WA 6008

Mud Map Draw a sketch of the location of the site below.



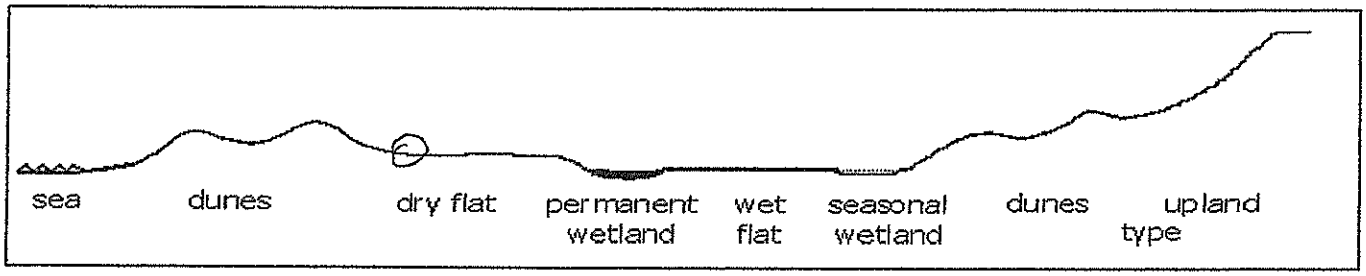
Road Location Track extension of Murrays Rd

Geographic Location Latitude 33° 49' 42" S Longitude 121° 31' 20"E Altitude 40m

Reference Map Aerial photograph provided

Photograph Photographer's Name Coral Turley

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope flat (gentle) steep ***Aspect*** N NE E SE S SW W (NW)

Surface soil Sand ***Colour*** grey / brown

Exposed rock None ***type*** % surface

Sub-surface Soil Sand ***Colour*** white

Rock ✓ ***type*** Limestone depth to rock

Drainage (well) mod poor depth water cm ***Wet*** all year winter/spring

Litter 95% cover ***Bare Ground*** None % cover

Depth 2cm

BUSHLAND PLANT SURVEY RECORDING SHEET 2 - use pencil only

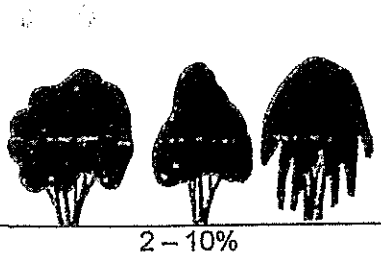
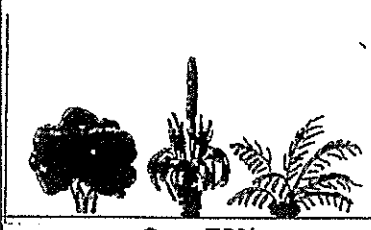
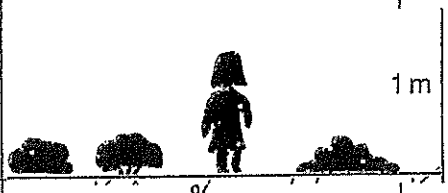
From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc), PO Box 64 Nedlands WA 6008

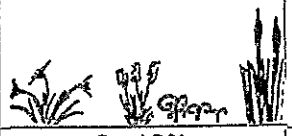
3. VEGETATION STRUCTURE AND COVER

For each layer **record** – appropriate **life form, cover class** (see below) and **dominant species** in each layer.

Cover Class	2 – 10%	10 – 30%	30 – 70%	over 70%

	TREES			MALLEES	
	over 30m	10 – 30m	under 10m	over 8m	under 8m
LIFE FORM					
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS		SHRUBS
	over 2m	2m – 1m	Under 1m
LIFE FORM			
COVER CLASS (%)	2 – 10%	Over 70%	%
DOMINANT SPECIES	*Acacia rostellifera* *Acacia cyclops*	*Spyridium globulosum* *Leucopogon parviflorus* *Olearia axillaris*	*Dianella revoluta* *Adriana quadripartita* *Lasiopetalum discolor*

	GRASSES	HERBS	SEDGES	OTHER
LIFE FORM				
COVER CLASS (%)	> 2%	> 2%	2 - 10%	
DOMINANT SPECIES	*Austrostipa* sp	*Brachyscome iberidifolia*	*Desmocladus flexuosus* *Lepidosperma drummondii*	

4. VEGETATION CONDITION

	✓
1 'PRISTINE'	
2 EXCELLENT	
3 VERY GOOD	
4 GOOD	
5 DEGRADED	

COMMENTS

Old, very dense on one side of road – some dead shrubs other side where firebreak has been slashed

Appendix B

Plant Inventory arranged in family order

Quallilup Survey 2008 - 9

Plant list in family order

Status	Family	Name	Common name	Elevated site	Lower site
	CUPRESSACEAE	*Callitris drummondii*	DRUMMOND'S CYPRESS PINE		✓
		Callitris roei	ROE'S CYPRESS PINE	✓	
	POACEAE	*Austrodanthonia* sp *caespitosa ?*		✓	✓
		Austrostipa sp	SPEAR GRASS		✓
*		*Briza minor*	SHIVERY GRASS		✓
*		*Lagurus ovatus*	HARE'S TAIL GRASS		✓
		Poa poiformis	COASTAL POA		✓
	CYPERACEAE	*Gahnia* sp		✓	
		Ficinia nodosa	KNOTTED CLUB RUSH	✓	✓
		Lepidosperma gladiatum	COAST SWORD SEDGE	✓	✓
		Lepidosperma sp fine			✓
		Lepidosperma drummondii			✓
		Lepidosperma squamatum		✓	
	RESTIONACEAE	*Desmocladus flexuosus*		✓	✓
	DASYPOGONACEAE	*Lomandra micrantha* subsp *teretifolia*		✓	✓
		Lomandra nigricans		✓	
	PHORMIACEAE	*Dianella brevicaulis*		✓	✓
	ANTHERICACEAE	*Thysanotus patersonii*	FRINGE LILY		
		Tricoryne elatior	YELLOW AUTUMN LILY		✓
	IRIDACEAE	*Orthrosanthos* sp			✓
		Patersonia occidentalis	PURPLE FLAG	✓	✓
		Thysanotus patersonii		✓	
	ORCHIDACEAE	*Caladenia* sp			✓
		Cyrtostylis robusta	MOSQUITO ORCHID		✓
*		*Disa bracteata*	SOUTH AFRICAN ORCHID		✓
		Eriochilus dilatatus	BUNNY ORCHID	✓	✓
		Microtis media	COMMON MIGNONETTE ORCHID		✓
		Prasophyllum sp	LEEK ORCHID		✓

	DICOTYLEDONS				
Status	Family	Name	Common name	Elevated site	Lower site
	APIACACAE	*Trachymene pilosa*	NATIVE PARSNIP		✓
*	ASTERACEAE	*Arctotheca calendula*	CAPE WEED		✓
		Brachyscome ciliaris	VARIABLE DAISY	✓	✓
		Brachyscome iberidifolia	SWAN RIVER DAISY		✓
*		*Centaurea melitensis*	MALTESE COCKSPUR		✓
*		*Cirsium vulgare*	SPEAR THISTLE		✓
		Olearia axillaris	COAST DAISY BUSH	✓	✓
		Podolepis rugata	PLEATED PODOLEPIS	✓	✓
		Senecio pinnatifolius	GROUNDSEL	✓	
		Waitzia nitida			✓
	CHENOPODIACEAE	*Rhagodia preissii*		✓	✓
	DILLENIACEAE	*Hibbertia cuneiformis*	CUT LEAFGUINEA FLOWER		✓
		Hibbertia racemosa	STALKED GUINEA FLOWER		✓
	EPACRIDACEAE	*Leucopogon obovatus*		✓	✓
		Leucopogon parviflorus	COAST BEARD HEATH	✓	✓
		Leucopogon pleurandroides		✓	
P3		*Leucopogon rotundifolius*		✓	
	EUPHORBIACEAE	*Adriana quadripartita*	BITTER BUSH	✓	✓
		Phyllanthus calycinus	FALSE BORONIA	✓	✓
	GERANIACEAE	*Pelargonium littorale*			✓
	GOODENIACEAE	*Goodenia concinna*	ELEGANT GOODENIA	✓	
		Goodenia tripartita		✓	
		Scaevola crassifolia	THICK-LEAVED FANFLOWER	✓	
		Velleia trinervis		✓	
	HALORAGACEAE	*Haloragis digyna*			✓
	LAMIACEAE	*Westringia dampieri*		✓	

Plant list in family order

Status	Family	Name	Common name	Elevated site	Lower site
	LAURACEAE	*Cassytha racemosa*	DODDER LAUREL	✓	
	LINACEAE	*Linum marginale*	WILD FLAX		✓
	LOGANIACEAE	*Logania fasciculata*		✓	✓
	MIMOSACEAE	*Acacia cochlearis*	RIGID WATTLE	✓	
		Acacia cylcops	COASTAL WATTLE	✓	✓
		Acacia nigricans		✓	✓
		Acacia rostellifera		✓	✓
		Acacia saligna	ORANGE WATTLE	✓	✓
	MYRTACEAE	*Calothamnus quadrifidus*	ONE-SIDED BOTTLEBRUSH	✓	
		Darwinia vestita	POM POM DARWINIA		✓
		Eucalyptus angulosa	RIDGE-FRUITED MALLEE	✓	✓
		Melaleuca brevifolia			✓
		Melaleuca lanceolata	ROTTNEST TEATREE	✓	
		Melaleuca pentagona subsp *latifolia*		✓	✓
		Melaleuca pulchella	CLAW HONEY-MYRTLE	✓	✓
	PAPILIONACEAE	*Gompholobium* sp			✓
		Pultenaea quaerita		✓	✓
		Pultenaea tenuifolia			✓
		Templetonia retusa	COCKIES TONGUE	✓	✓
	PITTOSPORACEAE	*Billardiera heterophylla*	AUSTRALIAN BLUEBELL	✓	✓
	POLYGALACEAE	*Comesperma virgatum*	MILK WORT		✓
	POLYGONACEAE	*Muehlenbeckia adpressa*	CLIMBING LIGNUM		✓
*	PRIMULACEAE	*Anagalis arvensis*	PIMPERNEL		✓
	PROTEACEAE	*Banksia speciosa*	SHOWY BANKSIA	✓	
		Grevillea oligantha		✓	
		Hakea nitida	FROG HAKEA	✓	✓
		Hakea prostrata	HARSH HAKEA	✓	

Qualliilup Survey 2008 - 9

Plant list in family order

Status	Family	Name	Common name	Elevated site	Lower site
	RANUNCULACEAE	*Clematis linearifolia*	SLENDER CLEMATIS	✓	✓
		Clematis pubescens	OLD MANS BEARD	✓	✓
	RHAMNACEAE	*Pomaderris myrtilloides*			
		Spyridium globulosum	BASKET BUSH	✓	✓
	RUTACEAE	*Nematolepis phebalioides*		✓	
		Rhadinothamnus rudis subsp *rudis*		✓	✓
	SCROPHULARIACEAE	*Euphrasia collina* subsp *tetragona*	PURPLE EYE-BRIGHT	✓	✓
	SOLANACEAE	*Anthocercis littorea*	YELLOW TAILFLOWER	✓	✓
*		*Solanum nigrum*	BLACKBERRY NIGHTSHADE		✓
		Solanum symonii		✓	✓
	STERCULIACEAE	*Guichenotia ledifolia*			
		Lasiopetalum discolor			✓
		Lasiopetalum quinquenervium		✓	✓
		Thomasia sp		✓	✓
	STYLIDIACEAE	*Stylidium pilosum*	SILKY TRIGGER PLANT	✓	
	THYMELAEACEAE	*Pimelea ferruginea*		✓	✓
	ZYGOPHYLLACEAE	*Zygophyllum billardierei*	COAST TWINLEAF		✓

Appendix C

Bird List

Murray's Lime Area Quallilup 33° 49' 49" S 121° 31' 33" E

Bird Survey...24/04/2009

Common Name	Genus	Species		
Sooty Oystercatcher	*Haematopus*	*fuliginosus*		
White-bellied Sea-Eagle	*Haliaeetus*	*leucogaster*		
Shining Bronze-Cuckoo	*Chalcites*	*lucidus plagosus ssp*		
Southern Emu-wren	*Stipiturus*	*malachurus paremida ssp*		
White-browed Scrubwren	*Sericornis*	*frontalis mellori ssp*		
Inland Thornbill	*Acanthiza*	*apicalis venus ssp*		
Willie Wagtail	*Rhipidura*	*leucophrys*		
Grey Butcherbird	*Cracticus*	*torquatus leucopterus ssp*		
Australian Magpie	*Gymnorhina*	*tibicen dorsalis ssp*		
Australian Raven	*Corvus*	*coronoides perplexus ssp*		
Welcome Swallow	*Hirundo*	*neoxena carteri ssp*		
Silvereye	*Zosterops*	*lateralis chloronotus ssp*		
kjr				

Government of **Western Australia**
Department of **Environment and Conservation**

Your ref:
Our ref: CPS 4782/1
Enquiries: Derek Jenkins
Phone: 9219 8769
Fax: 9219 8701
Email: nvp@dec.wa.gov.au

Mr Noel David Murray
Triple M Transport (WA) Pty Ltd
PO Box 900
ESPERANCE WA 6450

Dear Mr Murray

PERMIT TO CLEAR NATIVE VEGETATION UNDER THE *ENVIRONMENTAL PROTECTION ACT 1986*

I refer to your application to clear 8.8 hectares of native vegetation within Lot 471 on Deposited Plan 201723, Dalyup, for the purpose of limestone extraction (reference CPS 4782/1).

In an email from Lindsay Stephens, dated 23 May 2012 an updated rehabilitation program was provided. After carefully reviewing the program, I am of the opinion that the plan is inadequate. The revegetation program is missing information on target densities, time frames and schedules as to when the revegetation will be complete, a species list of the plants being used and a contingency plan for areas that are unsuccessfully rehabilitated. Considering this, I have decided to grant a permit subject to a revegetation condition.

Please find enclosed your permit to clear native vegetation granted under s.51E of the *Environmental Protection Act 1986*. This permit authorises you to clear, subject to certain terms, conditions or restrictions. A copy of your permit is now available for the public to view, as required by the regulations.

A copy of the Decision Report is attached for your information. The Decision Report is also available for the public to view.

Please read your permit carefully. If you do not understand your permit, contact the Department of Environment and Conservation (DEC) immediately. Be aware that there are penalties for failing to comply with the requirements of your permit.

If you are aggrieved by this decision an appeal may be lodged with the Minister for Environment. If you choose to appeal, it must be in writing, clearly set out the grounds of your appeal, and be received by the Minister within 21 days of being notified of the decision. More information on lodging an appeal is available from the Office of the Appeals Convenor on telephone 6467 5190. Completed appeals should be posted or delivered to:

Office of the Appeals Convenor
Level 22 Forrest Centre
221 St George's Terrace, PERTH WA 6000
Tel: 6467 5190 Fax: 6467 5199
Email: admin@appealsconvenor.wa.gov.au
Web: www.appealsconvenor.wa.gov.au

Third parties may also appeal against the grant of this permit or its conditions.

Please note that clearing must not commence until the date stated on the permit, or in the event of an appeal, after the appeal has been determined and you have been notified that you may proceed.

Be aware also that compliance with the terms, conditions or restrictions of this permit does not absolve the Permit Holder from responsibility for compliance with the requirements of all Commonwealth, State and Local Government legislation.

If you have any queries regarding this approval, please contact Derek Jenkins at the Department's Native Vegetation Conservation Branch on 9219 8744.

Yours sincerely

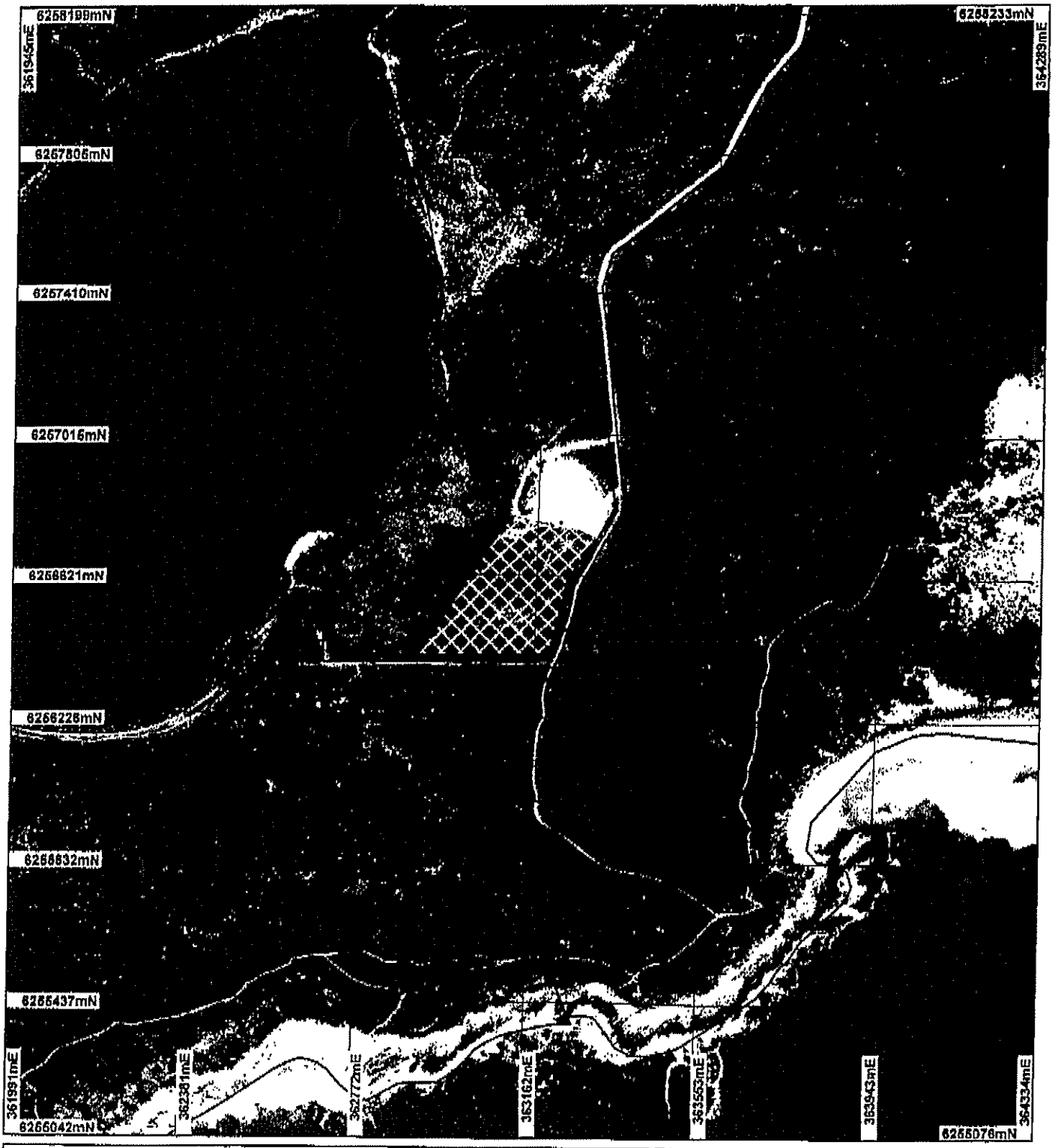
Roxane Shadbolt
A/MANAGER
NATIVE VEGETATION CONSERVATION BRANCH

Officer delegated under Section 20
of the Environmental Protection Act 1986

20 September 2012

Attached: Clearing Permit (CPS 4782/1), Plan 4782/1 and Decision Report.
Fact Sheet: Complying with your Clearing Permit

Plan 4782/1



LEGEND

Clearing Instruments

Areas Approved to Clear

Cadastre

Esperance Causeway 50cm Orthomosaic - Landgate 2007

N

0 375 m

Scale 1:13895
(Approximate when reproduced at A4)

Geocentric Datum Australia 1994

Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies

R. Shadbolt Date 19/9/12
R. Shadbolt

Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.

Department of Environment and Conservation

Our environment, our future

* Project Data. This data has not been quality assured. Please contact map author for details.

Department of Environment and Conservation

Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 4782/1
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: **Triple M Transport (WA) Pty Ltd**

1.3. Property details

Property: LOT 471 ON PLAN 201723 (DALYUP 6450)
Local Government Area: Shire of Esperance
Colloquial name:

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
8.8		Mechanical Removal	Extractive Industry

1.5. Decision on application

Decision on Permit Application: Grant
Decision Date: 20 September 2012

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description	Clearing Description	Vegetation Condition	Comment
Beard Vegetation Association: 42 Shrublands; mallee and acacia scrub on south coastal dunes (Shepherd, 2009).	The application is to progressively clear 8.8 hectares over a ten year period for the purpose of extracting limestone.	Very Good: Vegetation structure altered; obvious signs of disturbance (Keighery 1994)	The condition of the vegetation was obtained through aerial photography (Esperance Causeway 50cm Orthomosaic - Landgate 2007).
125: bares areas salt lakes (Shepherd, 2009)	The vegetation is considered to be low lying areas of shrub mallee and health on sandy soil (Esperance Wildflower Society Inc, 2009).		
	The vegetation under application is considered to be in a very good (Keighery, 1994) condition. The northern boundary of the application area appears to have historical impact from the adjacent previous excavation area.		

3. Assessment of application against clearing principles

Comments

The application is to progressively clear 8.8 hectares over a ten year period for the purpose of extracting limestone approximately 40km west of the Esperance townsite. A vegetation report undertaken by the Esperance Wildflower Society in March 2009 indentified a total of 75 flora species within the application area, out of the 75 species 8 where indentified as being weed species.

Only one fauna species of conservation significance (Hooded Plover) has been recorded within a 10km radius of the application. Given the large percent of vegetation remaining in the local area (approximately 75 percent), it is considered unlikely that the proposed clearing will significantly impact upon this species or other local native fauna.

No declared rare or priority flora have been recorded within a 10km radius of the application. There has also

been no threatened ecological communities (TEC?s) mapped within 10km of the proposed clearing.

Approximately 95 percent of the vegetation under application comprises of Beard vegetation association 42, the other 5 percent is represented by Beard vegetation association 125 (Shepherd, 2009). Both recorded vegetation association identified are above the threshold level (30 percent) recommended in the National Objectives Targets for Biodiversity Conservation, below which species loss appears to accelerate exponentially at an ecosystem level (Commonwealth of Australia 2001). In addition to this, the application area is not within an extensively cleared landscape, with approximately 75 percent remaining within a 5km radius of the proposed clearing. Given this the vegetation under application is not considered significant as a remnant.

The disturbance resulting from the proposed clearing will increase the risk of weeds and dieback spreading into the adjacent remnant vegetation. Weed and dieback management practices will assist in mitigating this risk.

The application area is located approximately 350 metres east of Lake Quallilup, classified as a south coast significant wetland. The lake it also vested with the Conservation Commission Western Australia, with its purpose being for conservation and recreation. In addition to this the, Lake Gore RAMSAR wetland has been mapped approximately 500 metres of the proposed clearing area. The area between the wetlands and application area appears to be well vegetated with minimal disturbance. The topography in the area is considered to be low relief ranging between 40 to 60 AHD.

The removal of vegetation from the area may increase the amount of surface water runoff in the area, thus mobilizing excess sedimentation which may subsequently infiltrate into the nearby mapped wetlands and lead to deterioration of these wetlands. However, given that there is approximately 350 metres of vegetation remaining between Lake Quallilup and the proposed clearing site and approximately 500 metres of vegetation remaining between Lake Gore and the application area, the impacts upon these wetlands are likely to be minimal. In addition to this, the applicant has advised that clearing is to be carried out in stages over a 10 year period, with revegetation to occur once each stage has been completely excavated. A structured revegetation plan will assist in mitigating environmental harm to these sensitive wetland areas.

The application has been assessed against the clearing principles and is not likely to be at variance to any of the clearing principles.

Methodology

References:
Commonwealth of Australia (2001)
Esperance Wildflower Society (2009)
Shepherd (2009)
GIS Database:
-SAC Biodatasets - accessed January 12
- Hydrography linear
-Pre-European vegetation

Planning Instrument, Native Title, Previous EPA decision or other matter.

Comments

An extractive industry licence was granted by the Shire of Esperance on 30 October 2000 and renewed in October 2001 for a period of 21 years (Triple M Transport Pty Ltd, 2012).

The application is within the Esperance Groundwater RIWI Area. The Department of Water (DoW) 2012 has no objections to the proposal and provides the following comments; Measure should be implemented as a condition of clearing, that run-off from the site should not be directed towards Lake Quallilup (DoW, 2012).

Methodology

References:
Department of Water (2012)
Trimple M Transport (2012)

4. References

Commonwealth of Australia (2001) National Objectives and Targets for Biodiversity Conservation 2001-2005, Canberra.

Department of Water (2012) Advice regarding Clearing Permit Application CPS 4782/1, Triple M Transport (WA) Pty Ltd (DEC Ref: A466223)

Esperance Wildflower Society (Inc) (2009) Quallilup Vegetation Report. Additional information within Clearing Permit Application 4782/1, Triple M Transport (WA) Pty Ltd (DEC Ref:A460110)

Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Shepherd, D.P. (2009) Adapted from: Shepherd, D.P., Beeston, G.R., and Hopkins, A.J.M. (2001), Native Vegetation in Western Australia. Technical Report 249. Department of Agriculture Western Australia, South Perth.

Triple M Transport (WA) Pty Ltd (2012) Supporting Information for Clearing Permit Application CPS 4782/1 Triple M Transport (WA) Pty Ltd (DEC Ref:A475235)

5. Glossary

Term	Meaning
BCS	Biodiversity Coordination Section of DEC
CALM	Department of Conservation and Land Management (now BCS)
DAFWA	Department of Agriculture and Food
DEC	Department of Environment and Conservation
DEP	Department of Environmental Protection (now DEC)
DoE	Department of Environment
DoIR	Department of Industry and Resources
DRF	Declared Rare Flora
EPP	Environmental Protection Policy
GIS	Geographical Information System
ha	Hectare (10,000 square metres)
TEC	Threatened Ecological Community
WRC	Water and Rivers Commission (now DEC)

GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 4782/1
Permit Holder:	Triple M Transport (WA) Pty Ltd
Duration of Permit:	12 October 2012 – 12 October 2027

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

PART I – CLEARING AUTHORISED

1. **Purpose for which clearing may be done**
   Clearing for the purpose of limestone extraction.

2. **Land on which clearing is to be done**
   Lot 471 on Deposited Plan 201723, Dalyup

3. **Area of Clearing**
   The Permit Holder must not clear more than 8.8 hectares of native vegetation within the area cross hatched yellow on attached Plan 4782/1.

4. **Period in which clearing is authorised**
   The Permit Holder shall not clear any native vegetation after 12 October 2022

5. **Application**
   This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

6. **Compliance with Assessment Sequence and Management Procedures**
   Prior to clearing any native vegetation under conditions 1, 2 and 3 of this Permit, the Permit Holder must comply with the Assessment Sequence and the Management Procedures set out in Part II of this Permit.

PART II – ASSESSMENT SEQUENCE AND MANAGEMENT PROCEDURES

7. **Avoid, minimise etc clearing**
   In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:
   (a) avoid the clearing of native vegetation;
   (b) minimise the amount of native vegetation to be cleared; and
   (c) reduce the impact of clearing on any environmental value.

8. **Dieback and weed control**
When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds* and *dieback*:
(a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
(b) shall only move soils in *dry conditions*;
(c) ensure that no *dieback* or *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
(d) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

9. **Retain vegetative material and topsoil, revegetation and rehabilitation**
The Permit Holder shall:
(a) retain the vegetative material and topsoil removed by clearing authorised under this Permit and stockpile the vegetative material and topsoil in an area that has already been cleared.

(b) at an *optimal time* following clearing authorised under this Permit, *revegetate* and *rehabilitate* the area(s) that are no longer required for the purpose for which they were cleared under this Permit by:
(i) re-shaping the surface of the land so that it is consistent with the surrounding 5 metres of uncleared land; and
(ii) ripping the ground on the contour to remove soil compaction; and
(iii) ripping the pit floor and contour batters within the extraction site; and
(iv) laying the vegetative material and topsoil retained under condition 9(a) on the cleared area(s) that are no longer required for the purpose for which they were cleared under this Permit.

(c) within 24 months of laying the vegetative material and topsoil on the cleared area in accordance with condition 9(b) of this Permit:
(i) engage an *environmental specialist* to determine the species composition, structure and density of the area *revegetated* and *rehabilitated*; and
(ii) where, in the opinion of an *environmental specialist*, the composition structure and density determined under condition 9(c)(i) of this Permit will not result in a similar species composition, structure and density to that of pre-clearing vegetation types in that area, *revegetate* the area by deliberately *planting* and/or *direct seeding* native vegetation that will result in a similar species composition, structure and density of native vegetation to pre-clearing vegetation types in that area and ensuring only *local provenance* seeds and propagating material are used.

(d) where additional *planting* or *direct seeding* of native vegetation is undertaken in accordance with condition 9(c)(ii) of this permit, the Permit Holder shall repeat condition 9(c)(i) and 8(c)(ii) within 24 months of undertaking the additional *planting* or *direct seeding* of native vegetation.

(e) where a determination by an *environmental specialist* that the composition, structure and density within areas *revegetated* and *rehabilitated* will result in a similar species composition, structure and density to that of pre-clearing vegetation types in that area, as determined in condition 9(c)(i) and (ii) of this permit, that determination shall be submitted for the CEO's consideration. If the CEO does not agree with the determination made under condition 9(c)(ii), the CEO may require the Permit Holder to undertake additional *planting* and *direct seeding* in accordance with the requirements under condition 9(c)(ii).

PART III - RECORD KEEPING AND REPORTING

10. Records must be kept

The Permit Holder must maintain the following records for activities done pursuant to this Permit:

(a) In relation to the clearing of native vegetation authorised under this Permit:
- (i) the species composition, structure and density of the cleared area;
- (ii) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings;
- (iii) the date that the area was cleared; and
- (iv) the size of the area cleared (in hectares).

(b) In relation to the *revegetation* and *rehabilitation* of areas pursuant to condition 9 of this Permit:
- (i) the location of any areas *revegetated* and *rehabilitated*, recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 1994 (GDA94), expressing the geographical coordinates in Eastings and Northings or decimal degrees;
- (ii) a description of the *revegetation* and *rehabilitation* activities undertaken;
- (iii) the size of the area *revegetated* and *rehabilitated* (in hectares);
- (iv) the species composition, structure and density of *revegetation* and *rehabilitation*, and
- (v) a copy of the environmental specialist's report.

11. Reporting

(a) The Permit Holder must provide to the CEO on or before 31 July of each year, a written report:
- (i) of records required under condition 10 of this Permit; and
- (ii) concerning activities done by the Permit Holder under this Permit between 1 July and 30 June of the preceding year.

(b) Prior to 12 July 2027, the Permit Holder must provide to the CEO a written report of records required under condition 10 of this Permit where these records have not already been provided under condition 11(a) of this Permit.

DEFINITIONS

The following meanings are given to terms used in this Permit:

dieback means the effect of *Phytophthora* species on native vegetation;

direct seeding means a method of re-establishing vegetation through the establishment of a seed bed and the introduction of seeds of the desired plant species;

dry conditions means when soils (not dust) do not freely adhere to rubber tyres, tracks, vehicle chassis or wheel arches;

environmental specialist means a person who is engaged by the Permit Holder for the purpose of providing environmental advice, who holds a tertiary qualification in environmental science or equivalent, and has experience relevant to the type of environmental advice that an environmental specialist is required to provide under this Permit;

fill means material used to increase the ground level, or fill a hollow;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

optimal time means the period from April to May.

planting means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species;

rehabilitate/ed/ion means actively managing an area containing native vegetation in order to improve the ecological function of that area;

revegetate/ed/ion means the re-establishment of a cover of *local provenance* native vegetation in an area using methods such as natural *regeneration*, *direct seeding* and/or *planting*, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area;

weed/s means a species listed in Appendix 3 of the "Environmental Weed Strategy" published by the Department of Conservation and Land Management (1999), and plants declared under section 37 of the *Agriculture and Related Resources Protection Act 1976*.

Roxane Shadbolt

Roxane Shadbolt
A/MANAGER
NATIVE VEGETATION CONSERVATION BRANCH

Officer delegated under Section 20
of the Environmental Protection Act 1986

20 September 2012

GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 4782/1
Permit Holder:	Triple M Transport (WA) Pty Ltd
Duration of Permit:	12 October 2012 – 12 October 2027

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   The Permit Holder shall not clear any native vegetation after 12 October 2022

5. **Application**
   This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

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(i) re-shaping the surface of the land so that it is consistent with the surrounding 5 metres of uncleared land; and
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- (iii) the size of the area *revegetated* and *rehabilitated* (in hectares);
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fill means material used to increase the ground level, or fill a hollow;

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planting means the re-establishment of vegetation by creating favourable soil conditions and planting seedlings of the desired species;

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revegetate/ed/ion means the re-establishment of a cover of *local provenance* native vegetation in an area using methods such as natural *regeneration, direct seeding* and/or *planting*, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area;

weed/s means a species listed in Appendix 3 of the "Environmental Weed Strategy" published by the Department of Conservation and Land Management (1999), and plants declared under section 37 of the *Agriculture and Related Resources Protection Act 1976.*

Roxane Shadbolt

Roxane Shadbolt
A/MANAGER
NATIVE VEGETATION CONSERVATION BRANCH

Officer delegated under Section 20
of the Environmental Protection Act 1986

20 September 2012

TRIPLE M

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

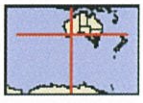
This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 13/03/17 14:00:59

Coordinates
Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	1
Listed Threatened Species:	41
Listed Migratory Species:	33

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	69
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	4
Regional Forest Agreements:	None
Invasive Species:	12
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Lake gore	Within Ramsar site

Listed Threatened Ecological Communities		[Resource Information]
For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.		
Name	Status	Type of Presence
Proteaceae Dominated Kwongkan Shrublands of the Southeast Coastal Floristic Province of Western Australia	Endangered	Community likely to occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat likely to occur within area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat likely to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Name	Status	Type of Presence
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica baueri Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat may occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta cauta Shy Albatross, Tasmanian Shy Albatross [82345]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche cauta steadi White-capped Albatross [82344]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Mammals		
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area

Name	Status	Type of Presence
Megaptera novaeangliae		
Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Neophoca cinerea		
Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Phascogale calura		
Red-tailed Phascogale, Red-tailed Wambenger, Kenngoor [316]	Vulnerable	Species or species habitat may occur within area
Plants		
Anigozanthos bicolor subsp. minor		
Little Kangaroo Paw, Two-coloured Kangaroo Paw, Small Two-colour Kangaroo Paw [21241]	Endangered	Species or species habitat likely to occur within area
Conostylis lepidospermoides		
Sedge Conostylis [9254]	Endangered	Species or species habitat likely to occur within area
Kennedia glabrata		
Northcliffe Kennedia [16452]	Vulnerable	Species or species habitat likely to occur within area
Lambertia echinata subsp. echinata		
Prickly Honeysuckle [56729]	Endangered	Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Sharks		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Breeding known to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Migratory Terrestrial Species		
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Resource Information]		
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Species or species habitat known to occur within area
Calidris alba Sanderling [875]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris ruficollis Red-necked Stint [860]		Species or species habitat known to occur within area
Catharacta skua Great Skua [59472]		Species or species habitat may occur within area
Cereopsis novaehollandiae grisea Cape Barren Goose (south-western), Recherche Cape Barren Goose [25978]	Vulnerable	Species or species habitat likely to occur within area
Charadrius ruficapillus Red-capped Plover [881]		Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea dabbenena Tristan Albatross [66471]	Endangered	Species or species habitat may occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Halobaena caerulea Blue Petrel [1059]	Vulnerable	Species or species habitat may occur within area
Himantopus himantopus Black-winged Stilt [870]		Species or species habitat known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat likely to occur within area
Phalacrocorax fuscescens Black-faced Cormorant [59660]		Foraging, feeding or related behaviour likely to occur within area
Pterodroma mollis Soft-plumaged Petrel [1036]	Vulnerable	Species or species habitat may occur within area
Puffinus assimilis Little Shearwater [59363]		Foraging, feeding or related behaviour known to occur within area
Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [1043]		Breeding known to occur within area
Recurvirostra novaehollandiae Red-necked Avocet [871]		Species or species habitat known to occur within area
Sterna anaethetus Bridled Tern [814]		Foraging, feeding or related behaviour likely to occur within area
Sterna caspia Caspian Tern [59467]		Foraging, feeding or related behaviour known to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Foraging, feeding or related behaviour may occur within area
Thalassarche cauta Tasmanian Shy Albatross [89224]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable*	Foraging, feeding or related behaviour likely to occur within area
Thinornis rubricollis Hooded Plover [59510]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat known to occur

Name	Threatened	Type of Presence within area
Fish		
Acentronura australe Southern Pygmy Pipehorse [66185]		Species or species habitat may occur within area
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area
Leptoichthys fistularius Brushtail Pipefish [66248]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phycodurus eques Leafy Seadragon [66267]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Stigmatopora nigra Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
Stigmatopora olivacea a pipefish [74966]		Species or species habitat may occur within

Name	Threatened	Type of Presence
		area
Urocampus carinirostris Hairy Pipefish [66282]		Species or species habitat may occur within area
Vanacampus margaritifer Mother-of-pearl Pipefish [66283]		Species or species habitat may occur within area
Vanacampus phillipi Port Phillip Pipefish [66284]		Species or species habitat may occur within area
Vanacampus poecilolaemus Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammals		
Arctocephalus forsteri Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat likely to occur within area
Neophoca cinerea Australian Sea-lion, Australian Sea Lion [22]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Reptiles		
Caretta caretta Loggerhead Turtle [1763]	Endangered	Breeding likely to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding likely to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area

Whales and other Cetaceans [Resource Information]

Name	Status	Type of Presence
Mammals		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Breeding known to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area

Name	Status	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat likely to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Recherche Archipelago	WA
Unnamed WA26885	WA
Unnamed WA32419	WA
Unnamed WA50792	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area

Nationally Important Wetlands [Resource Information]

Name	State
Lake Gore System	WA

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-33.82083 121.52556

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Species By Area

Specify a user-defined or predefined area to select.

Show optional criteria

Selection Type: Predefined / User-defined

Circle

Search Radius: 10 km

Latitude: 33 ° 49 ' 15 "S

Longitude: 121 ° 31 ' 32 "E

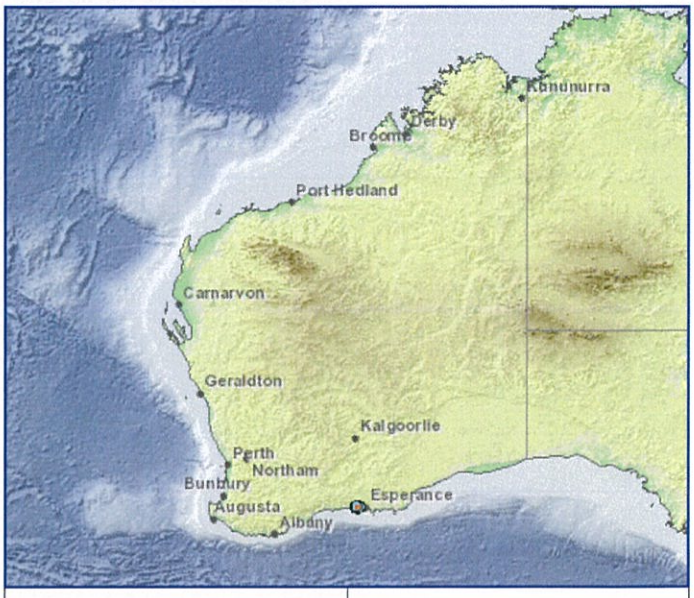
Submit Precise Coordinates

Group Results By: Family

Species Symbol Classification: Default / Unique / Group By

Zoom to selected species

Create Report | Print Map



Customise Map

Search Results

Method='By Circle'; Centre=121° 31' 32" E,33° 49' 15" S; Buffer=10km; Current Names Only=Yes; Core Datasets Only=Yes; Group By=Family;

Family	Names	Records
Acanthizidae	1	8
Accipitridae	2	4
Aegothelidae	1	1
Anatidae	10	70
Apiaceae	1	1
Araliaceae	1	1
Ardeidae	4	16
Artamidae	1	1
Asparagaceae	3	3
Asteraceae	7	9
Boraginaceae	1	1
Branchipodidae	1	1
Cacatuidae	1	1
Campanulaceae	1	1
Campephagidae	1	4
Caryophyllaceae	1	1
Casuariidae	1	3
Casuarinaceae	1	1
Ceinidae	1	3
Centrolepidaceae	4	4
Ceratopogonidae	1	2
Charadriidae	5	18
Chenopodiaceae	4	9
Chironomidae	2	4
Cladoniaceae	1	1
Columbidae	1	2
Corvidae	1	3
Cracticidae	3	6
Crassulaceae	1	1
Cupressaceae	1	3
Cyclopidae	2	3
Cyperaceae	9	10
Cyprididae	6	6
Daphniidae	1	1
Dicruridae	4	14
Droseraceae	2	2
Dytiscidae	2	2
Ephydridae	1	1
Ericaceae	3	3
Estrildidae	1	1
Fabaceae	6	6
Falconidae	3	3
Geraniaceae	1	1
Gobiidae	1	3
Haematopodidae	1	2
Haemodoraceae	1	1
Halcyonidae	1	4
Hemerocallidaceae	2	3
Hirundinidae	2	10
Iridaceae	1	1
Juncaceae	2	4

Laridae	3	10
Lauraceae	1	1
Loranthaceae	1	1
Maluridae	1	1
Malvaceae	1	1
Meliphagidae	6	26
Myrtaceae	13	16
Oniscidae	1	1
Orchidaceae	3	3
Ostracoda	1	1
Pachycephalidae	1	1
Pelecanidae	1	12
Peronosporaceae	1	1
Phalacrocoracidae	3	12
Phyllanthaceae	2	2
Poaceae	17	25
Podicipedidae	2	14
Polygonaceae	1	2
Pomatiopsidae	1	1
Pottiaceae	2	2
Primulaceae	1	1
Proteaceae	3	4
Psittacidae	2	4
Rallidae	2	6
Recurvirostridae	3	24
Rhodomelaceae	1	1
Rutaceae	1	1
Scincidae	2	3
Scolopacidae	3	18
Stratiomyidae	1	1
Stylidiaceae	1	1
Threskiornithidae	1	2
Zosteropidae	1	6
TOTAL	200	469

Acanthizidae
Acanthiza chrysorrhoa Yellow-rumped Thornbill
1 names, 8 records

Accipitridae
Circus approximans Swamp Harrier
Haliaeetus leucogaster White-bellied Sea-Eagle
2 names, 4 records

Aegothelidae
Aegotheles cristatus Australian Owlet-nightjar
1 names, 1 records

Anatidae
Anas castanea Chestnut Teal
Anas gracilis Grey Teal
Anas rhynchotis Australasian Shoveler
Anas superciliosa Pacific Black Duck
Aythya australis Hardhead
Biziura lobata Musk Duck
Chenonetta jubata Australian Wood Duck, Wood Duck
Cygnus atratus Black Swan
Malacorhynchus membranaceus Pink-eared Duck
Tadorna tadornoides Australian Shelduck, Mountain Duck
10 names, 70 records

Apiaceae
Daucus glochidiatus Australian Carrot
1 names, 1 records

Araliaceae
Trachymene pilosa Native Parsnip
1 names, 1 records

Ardeidae
Ardea modesta Eastern Great Egret IA
Ardea novaehollandiae White-faced Heron
Egretta novaehollandiae
Nycticorax caledonicus Rufous Night Heron
4 names, 16 records

Artamidae
Artamus cyanopterus Dusky Woodswallow
1 names, 1 records

Asparagaceae
Chamaescilla corymbosa Blue Squill
Lomandra collina Pale Mat Rush
Lomandra micrantha subsp. teretifolia
3 names, 3 records

Asteraceae
*Hypochaeris glabra Smooth Catsear
Lagenophora huegelii
Podolepis rugata Pleated Podolepis
Podotheca angustifolia Sticky Longheads
Siloxerus humifusus Procumbent Siloxerus
*Sonchus oleraceus Common Sowthistle
*Ursinia anthemoides Ursinia
7 names, 9 records

Boraginaceae

Heliotropium curassavicum Smooth Heliotrope
1 names, 1 records

Branchipodidae
Parartemia sp.
1 names, 1 records

Cacatuidae
Eolophus roseicapillus
1 names, 1 records

Campanulaceae
Wahlenbergia tumidifructa
1 names, 1 records

Campephagidae
Coracina novaehollandiae Black-faced Cuckoo-shrike
1 names, 4 records

Caryophyllaceae
*Polycarpon tetraphyllum Fourleaf Allseed
1 names, 1 records

Casuariidae
Dromaius novaehollandiae Emu
1 names, 3 records

Casuarinaceae
Allocasuarina huegeliana Rock Sheoak, Kwowl
1 names, 1 records

Ceinidae
Austrochiltonia sp.
1 names, 3 records

Centrolepidaceae
Aphelia brizula
Centrolepis aristata Pointed Centrolepis
Centrolepis drummondiana
Centrolepis strigosa Hairy Centrolepis
4 names, 4 records

Ceratopogonidae
Culicoides sp.
1 names, 2 records

Charadriidae
Charadrius ruficapillus Red-capped Plover
Elseyornis melanops Black-fronted Dotterel
Erythrogonys cinctus Red-kneed Dotterel
Vanellus miles Masked Lapwing
Vanellus miles subsp. novaehollandiae Masked Lapwing
5 names, 18 records

Chenopodiaceae
Enchylaena tomentosa Barrier Saltbush
Rhagodia baccata Berry Saltbush
Sarcocornia quinqueflora Beaded Samphire
Suaeda australis Seablite
4 names, 9 records

Chironomidae
Procladius paludicola
Tanytarsus barbitarsis
2 names, 4 records

Cladoniaceae
Cladia muelleri
1 names, 1 records

Columbidae
Ocyphaps lophotes Crested Pigeon
1 names, 2 records

Corvidae
Corvus coronoides Australian Raven
1 names, 3 records

Cracticidae
Cracticus tibicen Australian Magpie
Cracticus torquatus Grey Butcherbird
Strepera versicolor Grey Currawong
3 names, 6 records

Crassulaceae
Crassula closiana
1 names, 1 records

Cupressaceae
Callitris drummondii Drummond's Cypress Pine
1 names, 3 records

Cyclopidae
Meridiecyclops baylyi
Mesocyclops brooksi
2 names, 3 records

Cyperaceae

Cyperaceae
Baumea juncea Bare Twigrush
Chorizandra enodis Black Bristlerush
Ficinia nodosa Knotted Club Rush
Gahnia ancistrophylla Hooked-leaf Saw Sedge
Gahnia trifida Coast Saw-sedge
Lepidosperma sp.
Lepidosperma squamatum
Schoenus nanus Tiny Bog Rush
Schoenus subfascicularis
9 names, 10 records

Cyprididae
Australocypris insularis
Diacypris compacta
Diacypris spinosa
Mytilocypris mytiloides
Mytilocypris sp.
Platycypris baueri
6 names, 6 records

Daphniidae
Daphnia queenslandensis
1 names, 1 records

Dicruridae
Grallina cyanoleuca Magpie-lark
Myiagra inquieta Restless Flycatcher
Rhipidura albiscapa Grey Fantail
Rhipidura leucophrys Willie Wagtail
4 names, 14 records

Droseraceae
Drosera glanduligera Pimpernel Sundew
Drosera neesii Jewel Rainbow
2 names, 2 records

Dytiscidae
Necterosoma penicillatus
Necterosoma sp.
2 names, 2 records

Ephydridae
Ephydridae sp. 6 (SAP)
1 names, 1 records

Ericaceae
Leucopogon obovatus
Leucopogon sp. Lake Magenta (K.R. Newbey 3387) P1
Lissanthe pleurandroides
3 names, 3 records

Estrildidae
Stagonopleura oculata Red-eared Firetail
1 names, 1 records

Fabaceae
Acacia cyclops Coastal Wattle
Acacia saligna Orange Wattle, Kudjong
Chorizema ilicifolium Holly Flame Pea
Pultenaea heterochila
Pultenaea tenuifolia
*Trifolium campestre Hop Clover
6 names, 6 records

Falconidae
Falco berigora Brown Falcon
Falco cenchroides Australian Kestrel, Nankeen Kestrel
Falco longipennis Australian Hobby
3 names, 3 records

Geraniaceae
Pelargonium havlasae
1 names, 1 records

Gobiidae
Pseudogobius olorum
1 names, 3 records

Haematopodidae
Haematopus fuliginosus Sooty Oystercatcher
1 names, 2 records

Haemodoraceae
Anigozanthos rufus Red Kangaroo Paw
1 names, 1 records

Halcyonidae
Todiramphus sanctus Sacred Kingfisher
1 names, 4 records

Hemerocallidaceae
Dianella brevicaulis
Dianella revoluta Blueberry Lily
2 names, 3 records

Hirundinidae
Hirundo neoxena Welcome Swallow

Petrochelidon nigricans Tree Martin
2 names, 10 records

Iridaceae
Patersonia occidentalis Purple Flag, Koma
1 names, 1 records

Juncaceae
*Juncus bufonius Toad Rush
Juncus kraussii subsp. australiensis
2 names, 4 records

Laridae
Chroicocephalus novaehollandiae
Hydroprogne caspia
Larus novaehollandiae subsp. novaehollandiae Silver Gull
3 names, 10 records

Lauraceae
Cassytha racemosa Dodder Laurel
1 names, 1 records

Loranthaceae
Nuytsia floribunda Christmas Tree, Mudja
1 names, 1 records

Maluridae
Malurus leucopterus subsp. leuconotus White-winged Fairy-wren
1 names, 1 records

Malvaceae
Lawrencia glomerata
1 names, 1 records

Meliphagidae
Acanthorhynchus superciliosus Western Spinebill
Anthochaera carunculata Red Wattlebird
Anthochaera lunulata Western Little Wattlebird
Lichmera indistincta Brown Honeyeater
Manorina flavigula Yellow-throated Miner
Phylidonyris novaehollandiae New Holland Honeyeater
6 names, 26 records

Myrtaceae
Calytrix decandra Pink Starflower
Darwinia vestita Pom-pom Darwinia
Eucalyptus extensa
Eucalyptus incrassata Lerp Mallee
Eucalyptus leptocalyx Hopetoun Mallee
Eucalyptus preissiana subsp. lobata P4
Eucalyptus utilis
Eucalyptus varia subsp. varia
Melaleuca brevifolia
Melaleuca cuticularis Saltwater Paperbark
Phymatocarpus maxwellii
Thryptomene saxicola Rock Thryptomene
Verticordia sieberi var. sieberi
13 names, 16 records

Oniscidae
Haloniscus searlei
1 names, 1 records

Orchidaceae
Caladenia heberleana
Diuris concinna
Diuris decrementa
3 names, 3 records

Ostracoda
Ostracoda (unident.)
1 names, 1 records

Pachycephalidae
Colluricincla harmonica Grey Shrike-thrush
1 names, 1 records

Pelecanidae
Pelecanus conspicillatus Australian Pelican
1 names, 12 records

Peronosporaceae
Phytophthora cinnamomi
1 names, 1 records

Phalacrocoracidae
Microcarbo melanoleucos
Phalacrocorax sulcirostris Little Black Cormorant
Phalacrocorax varius Pied Cormorant
3 names, 12 records

Phyllanthaceae
Phyllanthus calycinus False Boronia
Poranthera microphylla Small Poranthera
2 names, 2 records

Poaceae

*Aira caryophyllea Silvery Hairgrass
Austrostipa mollis
*Briza maxima Blowfly Grass
*Briza minor Shivery Grass
*Bromus diandrus Great Brome
*Bromus hordeaceus Soft Brome
*Bromus rubens Red Brome
Distichlis distichophylla
*Ehrharta calycina Perennial Veldt Grass
*Ehrharta longiflora Annual Veldt Grass
*Hordeum marinum
Neurachne alopecuroidea Foxtail Mulga Grass
*Parapholis incurva Coast Barbgrass
Poa porphyroclados
*Polypogon monspeliensis Annual Beardgrass
Sporobolus virginicus Marine Couch
Vulpia sp.
17 names, 25 records

Podicipedidae
Podiceps cristatus Great Crested Grebe
Poliocephalus poliocephalus Hoary-headed Grebe
2 names, 14 records

Polygonaceae
*Rumex crispus Curled Dock
1 names, 2 records

Pomatiopsidae
Coxiella sp.
1 names, 1 records

Pottiaceae
Syntrichia antarctica
Triquetrella papillata
2 names, 2 records

Primulaceae
Samolus repens Creeping Brookweed
1 names, 1 records

Proteaceae
Banksia prolata subsp. calcicola P4
Hakea cinerea Ashy Hakea
Isopogon formosus subsp. formosus
3 names, 4 records

Psittacidae
Neophema elegans Elegant Parrot
Purpureicephalus spurius
2 names, 4 records

Rallidae
Fulica atra Eurasian Coot
Porzana tabuensis Spotless Crake
2 names, 6 records

Recurvirostridae
Cladorhynchus leucocephalus Banded Stilt
Himantopus himantopus Black-winged Stilt
Recurvirostra novaehollandiae Red-necked Avocet
3 names, 24 records

Rhodomelaceae
Polysiphonia decipiens
1 names, 1 records

Rutaceae
Rhadinothamnus rudis subsp. rudis
1 names, 1 records

Scincidae
Menetia greyii
Tiliqua rugosa subsp. rugosa
2 names, 3 records

Scolopacidae
Calidris ferruginea Curlew Sandpiper T
Calidris ruficollis Red-necked Stint IA
Tringa nebularia Common Greenshank IA
3 names, 18 records

Stratiomyidae
Stratiomyidae sp.
1 names, 1 records

Stylidiaceae
Stylidium adnatum Common Beaked Triggerplant
1 names, 1 records

Threskiornithidae
Threskiornis spinicollis Straw-necked Ibis
1 names, 2 records

Zosteropidae
Zosterops lateralis Grey-breasted White-eye, Silvereye
1 names, 6 records

Conservation Status
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

ATTACHMENT 2

Water Management Plan

Limestone Extraction for Agricultural Lime

Lot 520
Quallilup

February 2017

Landform Research
Land Systems - Quarries - Environment
ABN 29 841 445 694

CONTENTS

WATER QUALITY MANAGEMENT

FIGURES

See figures within the Management Plan

WATER QUALITY MANAGEMENT

1.0 BACKGROUND

1.1 Overview

An agricultural lime quarry has operated on Lot 502 since 2000.

This application seeks to extend the footprint to the east whilst allowing for the western existing pit to be closed and rehabilitated.

The limestone on Lot 502 is highly suitable for lime for agriculture and neutralisation of acidity, in addition to some road bases. Drilling has been completed and testing of the lime neutralising value carried out.

Location

The site lies approximately 40 km west from Esperance at the end of Murray's Road on the eastern side of Lake Quallilup, 300 metres from the lake and 500 metres from the closest portion of coast.

The subject land is owed by the proponent.

Current Land Use

Lot 502 is covered by pasture and remnant coastal vegetation. The land is used predominantly for grazing but has had a number of other agricultural activities on site over the years such as plantation.

The area applied for on Lot 502 is covered by remnant coastal vegetation that was burnt in summer 2015 to 2016.

The proposed quarry site lies immediately east from the existing approved pit, which is also used for agricultural lime.

1.2 Water Source Protection Areas

The site lies on the eastern edge of the Priority 2 zone of the Groundwater Protection Area Esperance near the boundary of Priority 1 to the east.

There are no production bores in the local area and ground water flow is west and south away from the protection area. Being so close to the coast groundwater will be flowing to the coast. With the sea water interface near the site, it would be unlikely that a production bore for water would be located at this location.

In 1999 the Water and Rivers Commission (now Department of Water) approved the existing quarry.

1.3 Water Source

It is not anticipated that any water will be required for dust suppression.

1.4 Water Quality Protection Guidelines

The protection of water whether groundwater or surface water is an important part of the management of quarries. Different types of quarries have different potential impacts which are listed below in general terms. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

Guidance on the quality of water can be found in;

- *Western Australian Water Quality Guidelines for Fresh and Marine Waters, EPA Bulletin 711, 1993.*
- *ANZECC, 1992, Australian Water Quality Guidelines for Fresh and Marine Waters.*

A number of documents provide guidance on the management and disposal of surface water that can lead to waterways, wetlands and underground water systems. These mainly apply to urban development but the methods are also applicable to the quarrying industry.

- *Engineers Australia 2003, Australian Runoff Quality, National Committee on Water Engineering.*
- *Stormwater Management Manual for Western Australia, Department of Environment WA, 2004.*
- *Guidelines for Groundwater Protection in Australia, ARMCANZ, ANZECC, September 1995.*

Documents specific to the mining and quarrying operations are the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing.

- *Overview*
- *Minesite water quality monitoring*
- *Minesite stormwater*
- *WQPN 28 Mechanical servicing and workshop (2006)*
- *Mine dewatering*
- *WQPN Landuse Compatibility in Public Drinking Water Source Areas (2004)*
- *WQPN 11 Water quality management in mining and mineral processing: mine dewatering.*
- *WQPN 15 Extractive Industries near sensitive water resources.*
- *Department of Water – Water resource considerations for extractive industries.*
- *Department of Water South West Region Guideline – Water resource considerations for extractive industries.*

The continued excavation complies with all the documents above. The most relevant documents are WQPN 15 *Extractive Industries near sensitive water resources* and *South West Region Guideline – Water resource considerations for extractive industries.*

Potable water will continue to be brought to the site. Serviced portable support facilities and ablutions are to be at the western end of the site.

2.0 PHYSICAL ATTRIBUTES

2.1 Geology and Geomorphology

The site is an eroded high ridge of interbeded sequences of coastal dunes, of limestone 40 to 60 metres overlying an undulating Proterozoic granitic basement that outcrops of granite at the coast.

The limestone is a calc-arenite made from beach sand containing predominantly shell fragments with minor and variable quartz. The limestone has been lithified and recrystallised on the ridge tops to lift the percentage of calcium carbonate to over 70%. The limestone sequences also include buried soil horizons and recalcified limestone overtopped by younger dunes.

The degree of lithification (hardness) changes over the property, and determines the use to which each type of limestone can be put.

The limestone is of Quaternary Age formed during changes to sea level during the Pleistocene.

2.2 Regolith and Soils

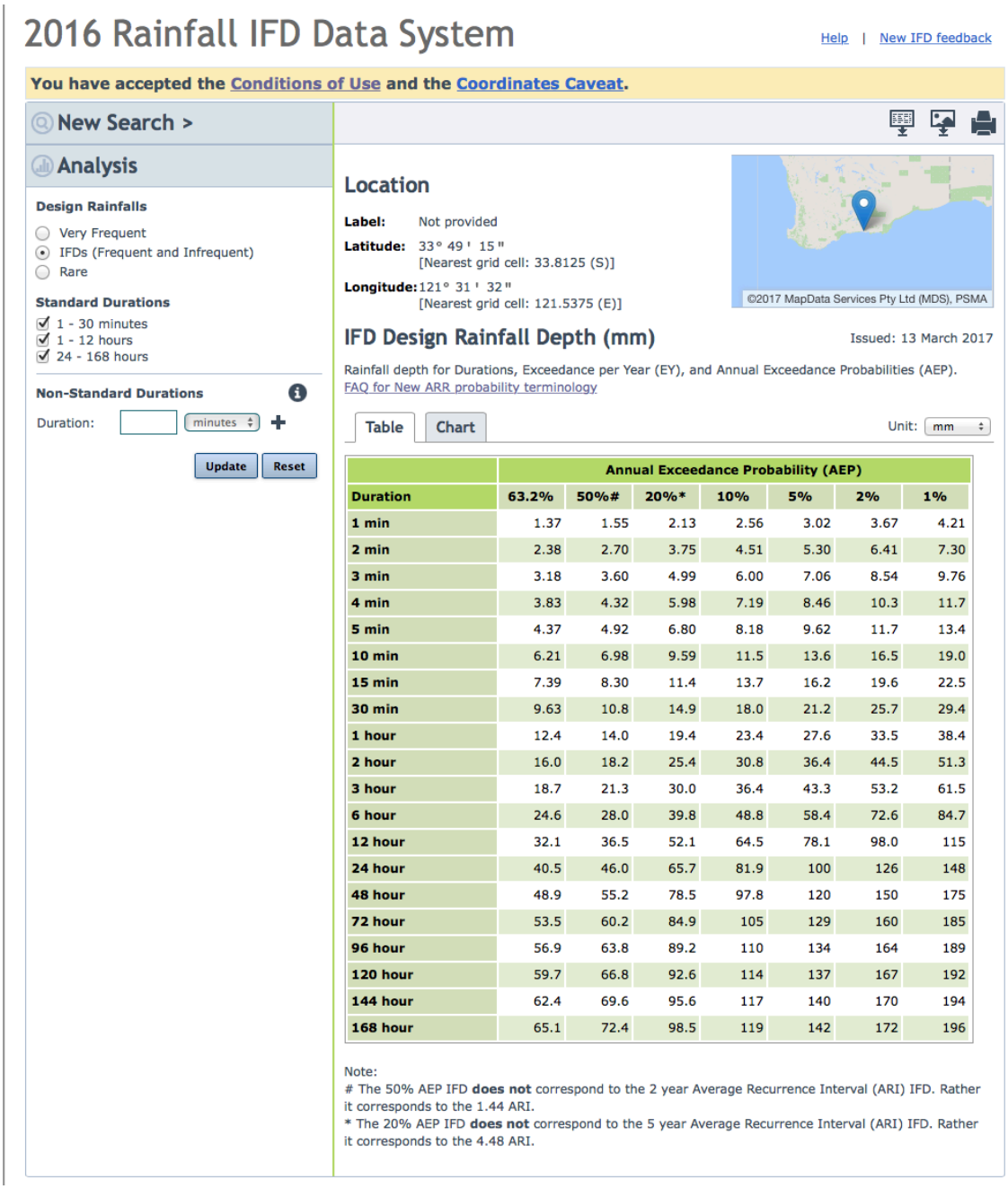
Soils on the site consist predominantly of grey organic sands in the swales over limestone with white to cream limey sands on the youngest dunes and surfaces.

2.3 Climate

The climate is semi-arid Mediterranean. Climate is recorded at Esperance although local rainfall is available. Temperatures average up to maxima of around 25 degrees in summer and down to 17 degrees in winter. Minima range from around 15 down to 7 degrees summer to winter.

Rainfall locally is approximately 625 mm per year based on farm data. Most of the rain falls in the months May to August inclusive. Evaporation is approximately 1700 mm per year. (Water and Rivers 1997 WRAP 5).

The wind direction is predominantly from the south.



2016 Rainfall IFD Data System

Help | New IFD feedback

You have accepted the Conditions of Use and the Coordinates Caveat.

New Search >

Analysis

Design Rainfalls

- Very Frequent
- IFDs (Frequent and Infrequent)
- Rare

Standard Durations

- 1 - 30 minutes
- 1 - 12 hours
- 24 - 168 hours

Non-Standard Durations

Duration: minutes

Update Reset

Location

Label: Not provided

Latitude: 33° 49 ' 15 "
[Nearest grid cell: 33.8125 (S)]

Longitude: 121° 31 ' 32 "
[Nearest grid cell: 121.5375 (E)]

IFD Design Rainfall Depth (mm)

Issued: 13 March 2017

Rainfall depth for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
FAQ for New ARR probability terminology

Table Chart

Unit: mm

	Annual Exceedance Probability (AEP)						
Duration	63.2%	50%#	20%*	10%	5%	2%	1%
1 min	1.37	1.55	2.13	2.56	3.02	3.67	4.21
2 min	2.38	2.70	3.75	4.51	5.30	6.41	7.30
3 min	3.18	3.60	4.99	6.00	7.06	8.54	9.76
4 min	3.83	4.32	5.98	7.19	8.46	10.3	11.7
5 min	4.37	4.92	6.80	8.18	9.62	11.7	13.4
10 min	6.21	6.98	9.59	11.5	13.6	16.5	19.0
15 min	7.39	8.30	11.4	13.7	16.2	19.6	22.5
30 min	9.63	10.8	14.9	18.0	21.2	25.7	29.4
1 hour	12.4	14.0	19.4	23.4	27.6	33.5	38.4
2 hour	16.0	18.2	25.4	30.8	36.4	44.5	51.3
3 hour	18.7	21.3	30.0	36.4	43.3	53.2	61.5
6 hour	24.6	28.0	39.8	48.8	58.4	72.6	84.7
12 hour	32.1	36.5	52.1	64.5	78.1	98.0	115
24 hour	40.5	46.0	65.7	81.9	100	126	148
48 hour	48.9	55.2	78.5	97.8	120	150	175
72 hour	53.5	60.2	84.9	105	129	160	185
96 hour	56.9	63.8	89.2	110	134	164	189
120 hour	59.7	66.8	92.6	114	137	167	192
144 hour	62.4	69.6	95.6	117	140	170	194
168 hour	65.1	72.4	98.5	119	142	172	196

Note:
The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.
* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

Figure 1 Rainfall Exceedance Chart

3.0 Hydrogeology

3.1 Background

Limestone and sand excavation does not affect the quality of water in the shallow ground water system because the only chemicals used are normal fuels and lubricants; a fact that is recognised by the Department of Water who permit extractive industries in Priority Groundwater areas.

3.2 Surface Water

The area has no surface drainage because of the permeable and porous nature of the limesand and limestone. Groundwater in the area flows south to the ocean.

3.3 Groundwater

The site lies on the eastern edge of a Priority 2 Area of the Groundwater Protection Area Esperance near the boundary of Priority 1 to the east.

There are no production bores in the local area and ground water flow is west and south away from the protection area. Being so close to the coast groundwater will be flowing to the coast.

Even so the existing limestone extraction and the proposed extraction complies with the Department of Water policies with respect to extraction in Priority Groundwater resource areas.

It has been estimated that perhaps 10 % of the rainfall will reach the water table. With an annual rainfall of around 600 mm this equates the 60 mm recharge per year.

4.0 PROTECTION OF WATER QUALITY

4.1 Surface Water, Dewatering and Drainage

There is no surface water and will be no dewatering or drainage because the limesand and limestone are so porous.

4.2 Groundwater Protection and Water Use

There will be no activities on site that will change the levels of solute in soils, ground or surface water.

4.3 Salinity Protection

The amount of clearing is minimal in the context of the areas involved, and there is no evidence of subsurface salinity, with the groundwater being fresh as shown in bores and dams on the local coastal area. Therefore the proposed clearing will not change the local recharge. A bore is located well to the east on Lot 502 and is used for stock.

Groundwater on site is fresh, flushed by high rainfall and porous soils.

There will be no activities on site that will change the levels of solute in soils, ground or surface water.

4.4 Recharge and Water use

The groundwater was considered by the *Environmental Protection Authority in Bulletins 512, 788, 821 and 818,* and whilst these do not specifically refer to the extraction of basic raw materials they do consider the impact of clearing, planting trees and rural residential developments. The figure the EPA used for recharge from native vegetation was 10 – 15% rainfall, whereas cleared land had a recharge of 30 – 40 % with an annual average rainfall in that area of 900 mm and close to the water table.

It has been estimated that perhaps 10 % of the rainfall will reach the water table at the processing area with slightly less at the ridge based on the separation to the water table.

Cleared land such as the pit floor will have an estimated recharge of 20% annual rainfall Therefore for one hectare of pit the additional recharge will result in an increase of 10 % of rainfall or perhaps 60 mm per year or 600 kL per hectare.

This proposal seeks Development Approval and an Extractive Industries Licence for a staged extraction area of approximately 16 hectares. At any one time it is anticipated that only 4.0 hectares of pit will be open.

The total ground open at any one time will be around 4 hectares which will result in a temporary increase in groundwater of around 5 000 to 8000 kL which will drop back to the normal recharge on closure and revegetation.

Potable water is to be brought to the site as needed.

4.5 Acid Sulfate Risk

There has been an increased interest in acid sulfate soils since the release of WAPC Planning Bulletin 64. However the interest has been over reactive and conditions and risk applied in many areas where there is no geological risk or evidence of acid sulfate.

Definitive survey procedure is produced in DEC (DER) 2013, *Identification of Acid Sulfate Soils and acidic Landscapes* and within document Acid Sulfate Soil Management Advisory Committee NSW, 1998, *Acid Sulfate Manual.* This information forms the basis for much of the assessment procedures in Australia, including those adopted by the Western Australian Planning Commission and the Department of Environment Regulation.

The *Acid Sulfate Manual* adopts the procedure of reviewing the published data followed up by field assessment, which has been completed for this site. If a geological risk is determined, then a Preliminary Acid Sulfate Assessment is conducted.

Acid Sulfate Soils can potentially form under reducing conditions when there is a source of carbon and a source of sulfur (normally from sea or saline water). Micro-organisms are thought to play an important role in reducing the sulfates within the sediments to form the iron sulfide. It is a natural phenomena, that can be exacerbated by disturbance.

Potential acid sulfate conditions most commonly form under current or past estuarine conditions, peaty conditions, and may also result from weathering of some geological formations and situations which contain sulfides.

The soils most at risk are normally saline/estuarine soils, gley soils, peat and some organoferricretes when exposed to the atmosphere.

Acid sulfate only becomes a potential risk when a number of circumstances are present.

- There is rock, soil or regolith present that is carrying sulfides.
- Sulfide carrying materials from below the water table are to be exposed to the atmosphere.
- Excavation below the water table is to be carried out exposing the sulfide carrying materials to oxygen in the atmosphere.
- Dewatering of the sulfide carrying materials is proposed, exposing them to oxygen.
- Exposure of peat or organoferricrete materials, that were permanently under reducing conditions, to the air.

None of these at risk conditions occur on site.

The site is elevated high $CaCO_3$ content limesand that is alkaline and oxidised with no evidence or potential of reducing conditions or other risk factors and none would be expected in this geological environment. This type of material is used to neutralize acidic conditions whether it be on agricultural soils or acidic conditions arising from acid sulfate impacts.

Therefore there is no risk of acid sulfate conditions.

4.6 Waste Rock and Tailings Management

Waste and Tailings management is considered in;

- *Department of Mines and Petroleum, 1999, Mining Environmental Management Guidelines, Safe Design and Operating Standards for Tailings Storage.*

As all the limesand is used in one type of product or another and any sub grade will be natural and suitable for rehabilitation there are no waste rock or tailings.

Potential "at risk" Waste Inventory - Characterisation

Type	Comment	Treatment	Reference
Saline surface water	Not present		
Saline ground water	Not present		
Acidic materials and drainage	Not present		
Sodic or dispersive materials	Not present		
Asbestos – asbestiform minerals	None present		
Radioactive materials	Not present		
Metallic or chemical materials	Not present		
Tailings storage	Not required		
Ablutions waste		Serviced portable facilities	Water Management Plan
Dangerous Goods and Hazardous Materials	***None will remain on closure***.	There are normally no hazardous materials used for hard rock quarrying, apart from fuel, blasting and servicing. The only other materials are for tasks such as weed management and are dealt with under those sections.	
	EXPLOSIVES	Not used	
	FUEL The various plant will be refueled from mobile tanker. ***None will remain on closure***.	Any soil or other materials with drips and spills will be removed offsite to an approved waste site or location. Fuel is discussed in the Water Management Plan.	Water Management Plan
	SERVICE MATERIALS Only minor lubrication will be conducted on site All major servicing will be conducted offsite. ***None will remain on closure***	Any wastes will be collected and removed from site promptly to an approved recycling or waste disposal area. Servicing is discussed in the Water Management Plan.	Water Management Plan
General waste		Regularly removed from site to an approved disposal area	Water Management Plan

- Wastes generated will be recycled wherever possible and periodically disposed of at an approved landfill site.

4.7 Unauthorised Access and Illegal Dumping

The potential for rubbish to be dumped relates mainly to unauthorised access and is low as the site is set back from roads. Access restrictions such as gates or barriers will be installed when the site is unmanned and equipment retained on site.

- Any illegally dumped materials are to be removed promptly to an approved landfill or other suitable site, depending on the nature of the material.

4.8 Solid Domestic and Light Industrial Wastes

Non essential or old plant and materials will be removed from the site. Locked gates and the existing fences will be maintained to prevent illegal dumping and contamination of water.

All solid domestic and light industrial wastes will be stored in commercial waste storage containers and/or removed to an approved landfill facility. There will be no waste disposal on site. Waste storage containers will be sealed so that rainfall cannot enter, therefore preventing the formation of leachates.

Wastes generated will be recycled wherever possible and periodically disposed of at an approved landfill site. Any illegally dumped materials are to be removed promptly to an approved landfill or other suitable site, depending on the nature of the material.

Regular inspections (at least weekly) are conducted to ensure no wastes, litter and the like are present in or around the excavation and processing area.

4.9 Wastewater Disposal

A service portable toilet system will be used when the site is manned. Serviced means they are pumped out by a licensed contractor from Albany or Denmark.

4.10 Refuelling

The protection of water from fuels and other chemicals is an important part of the management of quarries. Different types of quarries have different potential impacts which are listed below in general terms. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed

Extraction of hard rock is a clean operation similar to sand excavation in the nature of the risk to groundwater. Similar quarries have operated locally for many years with no known significant pollution incidents.

No chemicals are used apart from normal lubricants, which is similar to sand excavation, and sand excavation is one of the few industries that are permitted to operate in a Priority 1 Public Drinking Water Source Area, indicating the clean nature of the activity. See Department of Water *Land Use Compatibility in Public Drinking Water Source Areas.*

All spills are to be cleaned up in accordance with the summarised procedures following.

> *Documents specific to the fuel and maintenance are the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing*
>
> - *Mechanical servicing and workshop facilities*
> - *Above-ground fuel and chemical storage*
> - *WQPN 28 Mechanical servicing and workshop (2006)*
> - *WQPN 15 Extractive Industries near sensitive water resources.*
> - *Department of Water – South West Region Guideline – Water resource considerations for extractive industries.*

A list of the management actions for maintenance is provided. The actions will be used where applicable and as the opportunity presents to maintain water quality on this site.

Best Practice Quarry Management ensures high levels of safety and pollution management procedures for all their operations. Normally self contained service and recovery vehicles which undertake minor servicing in the field are used.

Fuel Management Plan

Fuel Storage

Currently it is proposed to use mobile tankers to refuel mobile and fixed plant when the site is manned.

Minor fuels will also be required for smaller mobile and fixed plant. Any drums for smaller plant will be retained on trucks and if placed on site will be stored in a bunded lined facility to retain 110% of the volume stored.

Fuel Spill Management Plan

- Fuel and maintenance will be carried out in accordance with the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing, *Mechanical servicing and workshop facilities* and *Above-ground fuel and chemical storage*.

- Soils, limestone and roadbase hardstand such as those on this site are adsorptive. The main risk of contamination is the minor drips that occur during the removal of hoses etc. Minor spills are quickly degraded by soil microbial matter.

- Refuelling and lubricating activities only occur in designated areas. Equipment for the containment and cleanup of spills is to be provided in these areas.

- Spillage will be contained in plant and working areas by shutting down plant or equipment if the plant or equipment is the source of the spill (provided it is safe to do so).

- In the event of a spill or adverse incident, activities will be stopped in that area until the incident is resolved.

- Any spills will be contained by the excavation or processing area. A fluid spill emergency response kit is in place. For larger spills soil and resource will quickly be placed around the spill to contain it in as small an area as possible. When contained, the contaminated soils will be scooped up and removed to an approved landfill or other approved site.

- All significant adverse incidents (such as a fuel spill of >5 litres) in one dump, are recorded, investigated and remediated. A record is to be kept of incidents and the Local Authority and Department of Environment Regulation notified within 24 hours. No such incidences have been recorded at the quarry.

- The only other risk is from a tank rupture, but tanks are designed to manage this eventuality. A commitment is made to notify Department of Environment Regulation/Department of Water and the local authority of any spill greater than 5 litres in one dump. This is much less than the DOW requirement trigger of 100 litres. Soil contaminated by large spills will be removed from the site to an approved disposal area.

- No significant non compliances have been recorded.

- Spillage will be contained in plant and working areas by shutting down plant or equipment if the plant or equipment is the source of the spill (provided it is safe to do so).

- Transport chemicals in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code).

4.11 Dangerous Goods and Hazardous Substances

There is no transport, storage or handling of hazardous materials involved in limestone - limesand extraction.

Fuel will be carried on vehicles when brought to site for refuelling. Fuel cartage will be governed by normal mobile fuel transport management and the DMP/DOW guidelines listed above. Minor fuel may be required for small on site mobile and fixed plant and hand equipment but this will not be stored on site unless personnel are on site.

4.12 Servicing and Maintenance

Documents specific to the fuel and maintenance are the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing

- *Mechanical servicing and workshop facilities*
- *Above-ground fuel and chemical storage*

The main risk of contamination comes from tank or hose rupture on earth moving machines. A spill kit containing absorbent granules is located on site for emergency use. A commitment is made to notify Department of Water and DMP of any spill greater than 5 litres. DER Guidelines suggest 100 litres but this is felt to be too high.

- All major servicing of vehicles will be conducted off site.

- Servicing plant and equipment will be in accordance with a maintenance schedule.

- Lubricating and maintenance activities are to occur in designated areas in the processing area and pit. Equipment for the containment and cleanup of spills is to be provided.

- Spillage will be contained in plant and working areas by shutting down plant or equipment if the plant or equipment is the source of the spill (provided it is safe to do so).

- Waste substances and chemicals will be stored in accordance with the Site Waste Guidelines.

- Waste oil and other fluids derived from the routine maintenance of mobile machinery, will be transported off site and disposed off at an approved landfill site. Grease canisters, fuel filters, oil filters and top-up oils will be stored in appropriate containers in a shed or brought to the site as required.

- Vehicle washdown is not proposed.

- Regular inspections and maintenance of fuel, oil and hydraulic fluids in storages and lines will be carried out for wear or faults.

- Accidental spill containment and cleanup protocol will be implemented as necessary.

- Any waste chemicals derived during routine maintenance activities will be stored in appropriate sealed containers within a designated storage area or taken from site and disposed of at an approved facility.

- Rubbish generated is to be recycled wherever possible and periodically disposed of at an approved landfill site.

- The site will be maintained in a tidy manner by removing all rubbish regularly offsite.

5.0 Monitoring

As there is no surface water and the groundwater is not being accessed, combined with the low inherent risk of excavating limesand and past experience, no water monitoring is required or proposed.

REFERENCES

DOW and DMP (2000). *Water Quality Protection Guideline: Above Ground Fuel and Chemical Storage.*

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WATER AND RIVERS
COMMISSION

YOUR REF TP7440/FP:dls
OUR REF SC772
ENQUIRIES Andrew Maughan
DIRECT TEL 9842 5760

CHIEF EXECUTIVE OFFICER
SHIRE OF ESPERANCE
PO BOX 507
ESPERANCE 6450

Att: Frank Polglaze

Dear Frank

PROPOSED EXTRACTION OF LIME SAND
LOC 471 MURRAY RD

Thank you for the opportunity to comment on the above proposal. The Commission would like to offer the followings comments on the proposed development's likely impacts on water resources.

The proposed lime sand extraction site is situated within the P1 area of the Esperance Water Reserve where land use controls are implemented to ensure the protection of the water quality of the public drinking water source. Within P1 areas, extractive industries such as this are a restricted land use. This means the WRC relies on appropriate land management practices to ensure there is no risk of groundwater contamination from the activity.

The attached '*Policy And Guidelines For Construction And Silica Sand Mining In Public Drinking Water Source Areas*' outlines the Commissions concerns and the practices that must be followed for the activity to be acceptable. The Commission strongly encourages the proponent to address these issues and for the Shire of Esperance to monitor and manage this where necessary.

Please note the stipulation that in P1 areas, a 3m separation be maintained between the base of the pit and the highest expected winter water table. The maximum permissible depth of excavation will need to be determined by an appropriately qualified and experienced professional. Compliance with this restriction may need to be monitored by the Shire.

As the site is upslope of the Quallilup Lake, measures should be taken to ensure runoff from the site does not impact on the water quality and ecological function of the lake. Natural runoff should be diverted around the excavation area. Stormwater runoff from the site should be contained on-site and not discharged unless turbidity, suspended solids and other contaminants are treated or removed.

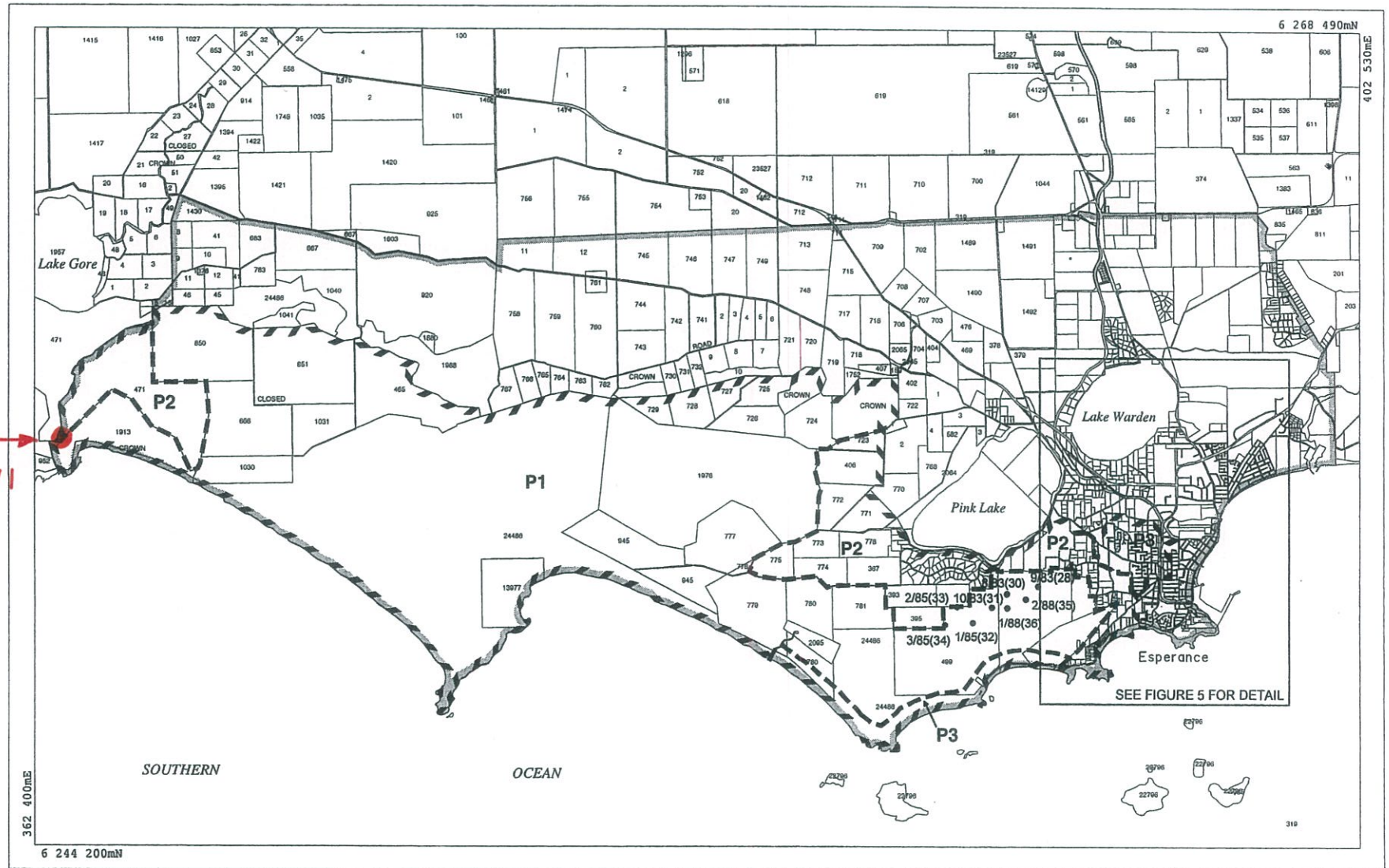
SOUTH COAST REGION
5 BEVAN STREET, ALBANY, W.A. 6330. P.O. Box 525, ALBANY, W.A. 6331
TELEPHONE (08) 9842 5760, FACSIMILE (08) 9842 1204
MANAGING AND PROTECTING WESTERN AUSTRALIA'S WATER RESOURCES

Clearing of vegetation should be restricted to the minimum area required for the operation, buffers maintained and revegetation implemented where appropriate and after completion of the excavation.

Provided the issues raised in the attached policy are addressed and the practices outlined in the proponents application are followed, the development should not impact on water resources in the area. If you require any more information please contact Andrew Maughan on 9842 5760.

Yours sincerely

Naomi Arrowsmith
REGIONAL MANAGER
5 November 1999



WATER AND RIVERS COMMISSION

LEGEND:

1 0 1 2 3 4km
Scale

- Production well
- Existing Water Reserve Boundary
- Proposed Water Reserve Boundary
- Priority zone protection area boundary

INDEX TO ADJOINING 1:100000 MAPS

3131	3231	3331
3130	3230	3330
	3229	3329

FIGURE 4.
PROPOSED ESPERANCE WATER RESERVE & PRIORITY PROTECTION AREAS

Drawn by N.J.A. Date 22/10/98

Policy and Planning Division
Water Quality Protection Branch

ATTACHMENT 3

7.2.5 EXTRACTIVE INDUSTRY LICENCE RENEWAL

Applicant: Triple M Transport (WA) Pty Ltd

Location/Address: Location 471 Murrays Road, Dalyup

File Ref: MUR2 LC471

Reporting Officer/Position: Richard Brookes - Executive Manager Development Services

Objective: To enable the Council to give consideration to an application to renew an extractive Industry licence on Location 471 Murrays Road, Dalyup.

Background: The Council has received an application from Triple M Transport (WA) Pty Ltd to renew an extractive Industry licence that has expired.

The extractive industry licence for the extraction of lime sand was originally considered following comments from the Department of Environmental Protection and subsequently approved by the Council at its ordinary meeting held 23 October 2000. A copy of the original report is attached as Appendix G.

The licence was issued on the 30 October 2000 and registration by the Department of Environmental Protection was issued 17 January 2001 under the *Environmental Protection Amendment Regulations (1987).*

Officer's Comment: The extractive industry has been operating continuously since that time, however due to an administrative error; it has been in operation without a licence since 30 October 2001.

Triple M Transport has applied to renew their licence for a period of 21 years.

Comments were sought from the Department of Environment and Conservation who advise that:

1. The site is already registered under the *Environmental Protection Regulations 1987* as a Category 70: Screening, etc. of material premises - less than 50,000 tonnes per year.
2. Advice should be given to the proponent that should the design capacity of the Screening plant increase to above 50,000 tonnes per year the occupier would need to apply for a licence as a Cat. 12 Screening facility.
3. As we already have the site registered, we don't really need to advise much more from an Industry Regulation point of view.
4. Ensure that the placement of overburden is in a pre-existing cleared area and does not cause damage to existing native vegetation.
5. The discharge of sediment into the environment could be a breach of the *Environmental Protection (Unauthorised Discharges) Regulations 2004*, and hence measures should be in place at the site to ensure that site drainage does not cause sediment or other contaminants to be discharged off the site (e.g. use of sediment traps or settling ponds)
6. Occupiers ensure that sufficient dust control measures are in place to ensure dust is contained within the boundary of the premises

The applicant has advised that they are proposing to remove 30,000 tonnes of material a year.
It should be noted that the Council has received numerous complaints from a resident on Murrays Road in relation to dust nuisance associated with this operation. Management of dust in the vicinity of the subject property will be a critical component of any road maintenance agreement.

Statutory Environment: Shire of Esperance Town Planning Scheme No 22 Shire of Esperance Extractive Industries Local Law.

Environmental Considerations: For the purpose of ensuring that an excavation site is properly restored or reinstated, the Shire of Esperance Extractive Industries Local Law states that the local government may require a bond or other security.

Financial Implications: The current bond in accordance with the schedule of fees and charges should be $4,200 per ha. The area of the current excavation is approximately 2ha and should attract a bond of $8,400.

The Council currently holds a $6923.55 bond for the reinstatement of the sand quarry and this amount should be sufficient for the extent of the current works if some remedial works is undertaken on land where no further excavation is to be undertaken.

Committee Recommendation:
Moved: Cr Stewart
Seconded: Cr Paxton

E0208-3662

That the application for the renewal of an extractive industry licence for the extraction of lime sand on Location 471 Murrays Road be approved subject to the following conditions;

1. ***The design capacity of the screening plant shall be limited to 30,000 tonnes per year;***
2. ***The licensee is to furnish to the local government a surveyor's certificate each year, prior to the renewal fee being payable, to certify the quantity of material extracted and that material has not been excavated below the final contour levels outlined within the approved excavation programme;***
3. ***The placement of the overburden is to be in a pre-existing cleared area and does not cause damage to existing native vegetation;***
4. ***Measures should be in place at the site to ensure that site drainage does not cause sediment or other contaminants to be discharged off the site (e.g. use of sediment traps or settling ponds) to ensure compliance with the Environmental Protection (Unauthorised Discharges) Regulations 2004;***
5. ***The proponent enters into a satisfactory road maintenance agreement with the Council to compensate for any damages occurring to Murray Road as a result of the operations.***
6. ***The haul road from the proposed lime pit in Lot 471 to the southern end of the formed section of Murrays Road shall be constructed and maintained at the applicants expense and as such all costs of construction of the haul road and ongoing maintenance shall be the responsibility of the applicant.***
7. ***Truck movements from and to the site along Murrays Road shall be limited to daylight hours, excluding Sunday and public holidays when work is not permitted.***
8. ***Sufficient dust control measures are to be in place to ensure dust is contained within the boundary of the premises; and***
9. ***Undertake remedial works to revegetate the site areas where further extraction of sand is not to be undertaken.***

CARRIED

F6 - A0

Voting Requirements: Simple Majority.

Council Resolution: O0208-1260

Department of Environmental Protection

Head Office:
Westralia Square
141 St Georges Terrace
Perth, Western Australia 6000
Tel (08) 9222 7000 Fax (08) 9322 1598
http://www.environ.wa.gov.au

Postal Address:
PO Box K822
Perth, Western Australia 6842

N D Murray
Triple M Transport
PO Box 900
ESPERANCE WA 6450

Your Ref
Our Ref 147010
Enquiries Juliet Cole

Dear Sir/Madam

PROPOSAL: **Lime sand extraction**
LOCATION: **Loc 471 Murray Road (East of Quallilup Lake)**
LOCALITY: **Esperance**
PROPONENT: **Triple M Transport**
ASSESSMENT: **Informal Review with Public Advice (and Works Approval registration under Part V)**

The Environmental Protection Authority understands that you wish to undertake the above proposal which has been referred to the Authority for consideration of its potential environmental impact.

This proposal raises a number of environmental issues, however, the Authority has decided not to subject this proposal to the formal environmental impact assessment process and the subsequent setting of formal conditions by the Minister for Environment, given the controls available under other approval processes.

Nevertheless, the staff of the Department will look at the proposal. Under delegation from the Authority, they will provide advice to you and relevant decision-making authorities on the environmental aspects of the proposal. That advice will be forwarded as soon as possible, and will be made available to the public.

You are advised that your project may also require a Works Approval and/or Licence under Part V of the Environmental Protection Act. Please contact Sandra McGowan in the Licensing Branch on 9222 7104 to determine your obligations under Part V of the Act if you have not already done so.

The information received regarding your proposal will be made publicly available on request. If you believe any part of the information relates to a manufacturing process or trade secret which is commercially confidential and should not be publicly available, please contact Joy Henry on 9222 8692 no later than 3 working days after the date of this letter.

Some members of the public may have preferred that the Authority undertake a formal assessment of the proposal. By law they have a 14-day period, closing 28-JAN-00, during which, on payment of the $10 appeal fee, they may ask the Minister for the Environment to consider directing the Authority to conduct a formal assessment.

The Environmental Protection Act requires that no decision should be made to allow or implement this proposal until after the appeal period has closed and any appeals received have been determined.

Please contact Leeanne Harris at the Minister for the Environment's office on 9221 8711 after the closing date of appeals to check whether any appeals against level of assessment were received.

Yours faithfully

K J Taylor
DIRECTOR
EVALUATION DIVISION

14 JAN 2000

OFFICE OF THE MINISTER FOR THE ENVIRONMENT;
LABOUR RELATIONS

Mr N D Murray
Triple M Transport
PO Box 900
ESPERANCE WA 6450

Dear Mr Murray

LIME SAND EXTRACTION, LOCATION 471 MURRAY ROAD, ESPERANCE

As you are aware, an appeal was lodged in objection to the level of assessment set by the Environmental Protection Authority for the above proposal.

Regulation 9 of the Environmental Protection Regulations requires that the proponent be advised of the outcome of the Minister's decision on any appeals.

To satisfy that requirement, I have enclosed a copy of the summary paper for appeal number 00/6, a copy of which will also be available to the public in the Department of Environmental Protection's library.

Yours sincerely

Harris

Leeanne Harris
A/REGISTRAR OF APPEALS to the
MINISTER FOR THE ENVIRONMENT

June 12, 2000

enc.

18th FLOOR, ALLENDALE SQUARE, 77 ST. GEORGE'S TERRACE, PERTH 6000 TELEPHONE: (08) 9421 7777 FACSIMILE: (08) 9221 4665, 9221 4668

APPEAL DECISION SUMMARY

APPEAL NO: 00/6

APPELLANT: CONSERVATION COUNCIL OF WA

PROPONENT: MR MURRAY – TRIPLE M TRANSPORT

PROPOSAL: LIME SAND EXTRACTION, LOCATION 471 MURRAY ROAD, ESPERANCE

NATURE OF APPEAL:

The appeal is lodged in objection to the level of assessment as set at Informal Review with Public Advice (and Works Approval registration under Part V) by the Environmental Protection Authority for the above proposal.

GROUNDS OF APPEAL:

1 The proposal will involve clearing of native vegetation. No further clearing should be permitted in the Shire of Esperance which already has less than 20% of natural vegetation remaining.

2 The area has conservation value, as it is an important linking corridor immediately adjacent to a nature reserve.

3 Informal assessment of this proposal is inconsistent with the EPA's recently released preliminary position statement on clearing.

4 Informal level of assessment does not allow proper review of the proposal's environmental impacts, nor the setting of binding environmental conditions.

DECISION OF THE MINISTER: DISMISSED

DATE OF DECISION: 12 JUNE 2000

Department of Environmental Protection

Head Office:
Westralia Square
141 St Georges Terrace
Perth, Western Australia 6000
Tel (08) 9222 7000 Fax (08) 9322 1598
http://www.environ.wa.gov.au

Postal Address:
PO Box K822
Perth, Western Australia 6842

Mr N D Murray
Triple M Transport
PO Box 900
ESPERANCE WA 6450

Our Ref *10/00*
Enquiries *Ben von Perger (9222 8642)*

Dear Sir

LIME SAND EXTRACTION, LOCATION 471 MURRAY ROAD (EAST OF QUALLILUP LAKE), SHIRE OF ESPERANCE

In my letter of 14 January 2000, I advised that the Environmental Protection Authority (EPA) had decided that formal environmental impact assessment was not required for the above proposal, but that it should be subject to 'Informal Review with Public Advice, and Works Approval and Registration under Part V of the *Environmental Protection Act 1986*'.

As you are aware, an appeal was lodged against this decision on 24 January 2000. The Minister for the Environment has now determined that this appeal should be dismissed. As such, the proposal remains subject to the above level of assessment.

Accordingly, under delegation from the EPA, the Department of Environmental Protection (DEP) provides the following advice.

- Ground disturbance and vegetation clearing should be minimised as far as possible to preserve existing native vegetation and to maintain soil stability.
- Wherever possible, topsoil should be direct returned to rehabilitation areas, and only locally indigenous native species are to be used for rehabilitation.
- I understand that you and Chris Tallentire of the DEP developed a rehabilitation plan for the proposal, entitled 'Noel Murray, Clearing and Regeneration of 14 hectares of Native Vegetation Esperance Location 471, Shire of Esperance: May 2000' (copy attached). The DEP recommends that the project area be rehabilitated in accordance with this rehabilitation plan.
- The DEP notes that, according to the Esperance Water Source Protection Plan (see Figure 4 attached), the proposal is located in part within the existing Esperance Water Reserve Boundary, and is located in part within a proposed Priority 2 protection area. To preserve the integrity of water resources, the proposal should be implemented in accordance with the Water and River Commission's draft Water Quality Protection Note on 'Extractive Industries within Public Drinking Water Source Areas' (see attached). In particular, any hydrocarbons (eg. fuel, oil) stored on site are to be contained within an impermeable bunded containment area, and all contaminated run-off is to be retained on site.

- Triple M Transport is required to comply with the *Environmental Protection (Noise) Regulations 1997.*
- I understand the Department of Conservation and Land Management (CALM) has advised that the access road from the proposal area to Murray Road be upgraded to prevent compaction and erosion, and to lessen the risk of introducing and/or spreading of dieback. The DEP endorses this advice, and suggests that you contact CALM's Esperance Office for further information and advice on this issue.
- The establishment and spread of environmental and noxious weeds within the project area should be prevented as far as possible. If a weed infestation occurs, weed eradication measures should be employed in consultation with CALM.
- Based on the information presented with the proposal, the proposal will require a Works Approval and Registration under the provisions of Part V of the *Environmental Protection Act 1986.* For further information on this matter please contact Rebecca Moen on ph 9222 7024.

The Department expects that the relevant decision making authorities will consider and implement this advice through the approvals process. If you have any questions on the above, please contact Ben von Perger on 9222 8642.

This advice does not remove your obligation to obtain necessary approvals and licences from other agencies.

Yours sincerely

K J Taylor
DIRECTOR
EVALUATION DIVISION

30 June 2000

cc CEO, Shire of Esperance: Attention: Ms Ellen Gude
Manager, DEP South West Region Office
DEP Pollution Prevention Division, Attn. Ms Rebecca Moen

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WATER AND RIVERS
COMMISSION

YOUR REF TP7440/FP:dls
OUR REF SC772
ENQUIRIES Andrew Maughan
DIRECT TEL 9842 5760

CHIEF EXECUTIVE OFFICER
SHIRE OF ESPERANCE
PO BOX 507
ESPERANCE 6450

Att: Frank Polglaze

Dear Frank

PROPOSED EXTRACTION OF LIME SAND
LOC 471 MURRAY RD

Thank you for the opportunity to comment on the above proposal. The Commission would like to offer the followings comments on the proposed development's likely impacts on water resources.

The proposed lime sand extraction site is situated within the P1 area of the Esperance Water Reserve where land use controls are implemented to ensure the protection of the water quality of the public drinking water source. Within P1 areas, extractive industries such as this are a restricted land use. This means the WRC relies on appropriate land management practices to ensure there is no risk of groundwater contamination from the activity.

The attached '*Policy And Guidelines For Construction And Silica Sand Mining In Public Drinking Water Source Areas*' outlines the Commissions concerns and the practices that must be followed for the activity to be acceptable. The Commission strongly encourages the proponent to address these issues and for the Shire of Esperance to monitor and manage this where necessary.

Please note the stipulation that in P1 areas, a 3m separation be maintained between the base of the pit and the highest expected winter water table. The maximum permissible depth of excavation will need to be determined by an appropriately qualified and experienced professional. Compliance with this restriction may need to be monitored by the Shire.

As the site is upslope of the Quallilup Lake, measures should be taken to ensure runoff from the site does not impact on the water quality and ecological function of the lake. Natural runoff should be diverted around the excavation area. Stormwater runoff from the site should be contained on-site and not discharged unless turbidity, suspended solids and other contaminants are treated or removed.

SOUTH COAST REGION
5 BEVAN STREET, ALBANY, W.A. 6330. P.O. Box 525, ALBANY, W.A. 6331
TELEPHONE (08) 9842 5760, FACSIMILE (08) 9842 1204

Clearing of vegetation should be restricted to the minimum area required for the operation, buffers maintained and revegetation implemented where appropriate and after completion of the excavation.

Provided the issues raised in the attached policy are addressed and the practices outlined in the proponents application are followed, the development should not impact on water resources in the area. If you require any more information please contact Andrew Maughan on 9842 5760.

Yours sincerely

Naomi Arrowsmith
REGIONAL MANAGER
5 November 1999

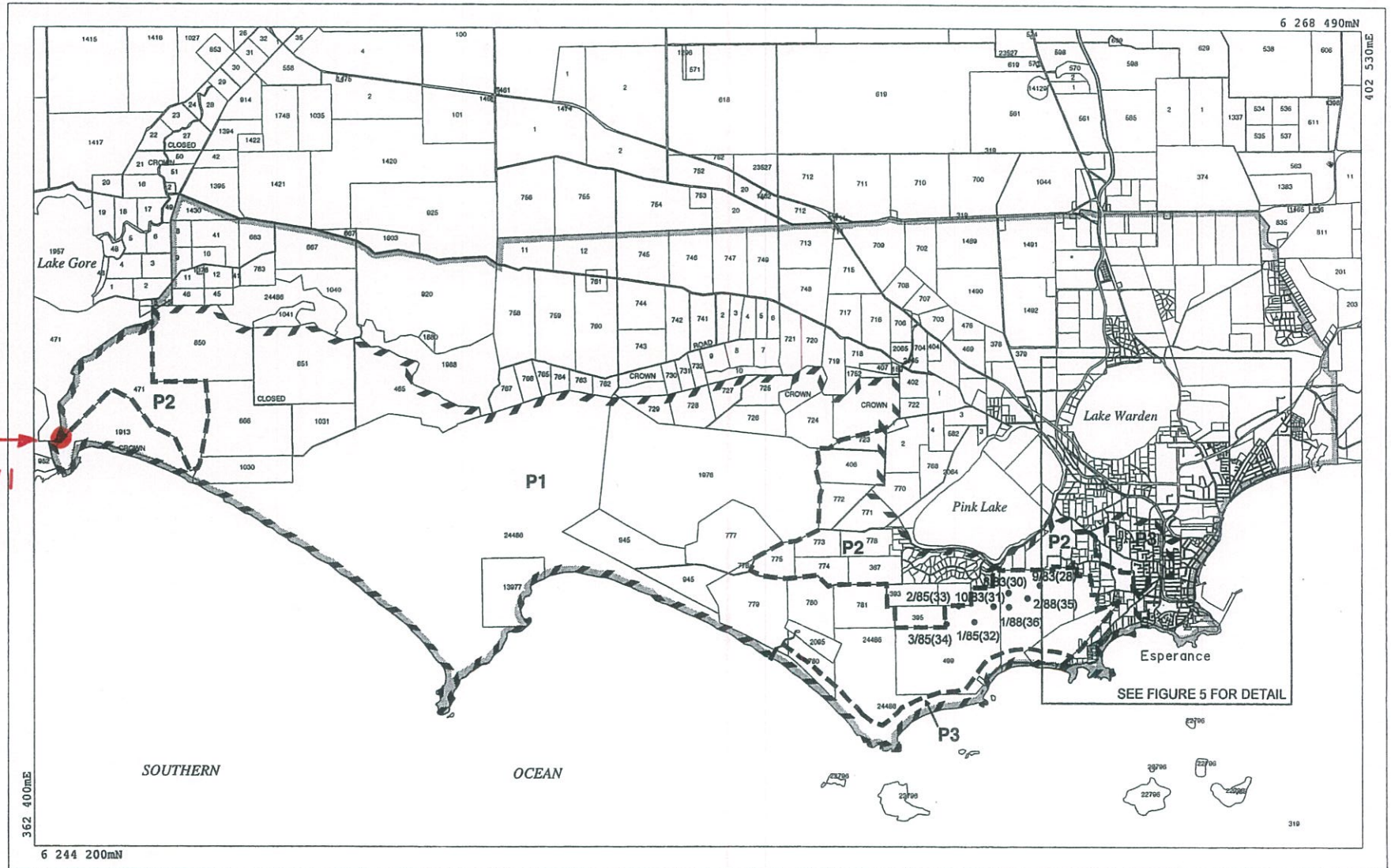


FIGURE 4.
PROPOSED ESPERANCE WATER RESERVE & PRIORITY PROTECTION AREAS

Drawn by N.J.A. Date 22/10/98

Policy and Planning Division
Water Quality Protection Branch

TRIPLE M TRANSPORT
PO Box 900
ESPERANCE WA 6450
Ph/Fax (08) 90761 291 Mobile: 018 934 627

Esperance Shire Council
PO Box 507
ESPERANCE WA 6450

4th December 1999

Attention: Barry Sponberge

Dear Barry,

RE: ISSUES RAISED BY THE WATERS AND RIVERS COMMISION

Please find enclosed answers to issues raised by The Waters and Rivers Commission.

Please note:

The proposed extraction borders on proposed P2 water reserve zone protection area to the east and P1 water reserve protection area to the south (according to The Water and Rivers Commission report WRP1 1999).

As the area is 50m above sea level, surrounding lakes and wet lands to the west and north west of extraction site, I would suggest that due to the ground water flows towards the coast or Lake Gore wet land system, that exposure of water table would be an impossibility (The Water and Rivers Report WRP1 1999).

Being in operation that would operate only in the Summer and Autumn months of the year would also alleviate any concerns with surface water.

The over burden embankment on western side of exposed area would act as a catchment for any run off water during storms or heavy rainfall periods. This would allow water to be retained and soak into porous lime sand.

It is proposed in my submission to the Commissioner of Soil and Land Conservation for the clearing of 14 hectares that the clearing be done in stages and rehabilitation is also staged leaving minimal area exposed.

Yours faithfully

Noel David Murray
DIRETOR TRIPLE M TRANSPORT (WA) Pty Ltd

TRIPLE M TRANSPORT
PO Box 900
ESPERANCE WA 6450
Ph/Fax (08) 90761 291 Mobile: 018 934 627

Esperance Shire Council
Po Box 507
ESPERANCE 6450

3 December 1999

Attention Mr Barry Sponberge

Dear Barry,

RE: ISSUES RAISED BY DEPARTMENT OF MINERALS AND ENERGY

Please find enclosed answers to issues raised by the Department of Minerals & Energy.

1. Have had a meeting with Les Coyne (Wild Life Officer) from CALM on the 22nd October 1999 regarding declared rare flora and fauna on locations 471, 26885 and 30672. According to CALM'S current maps and available information there are no rare species. He can be contacted on 90713733 if a further discussion is required.

2. See diagram 3.

3. With staged rehabilitation and natural vegetation on three sides wind erosion will be kept to a minimum.

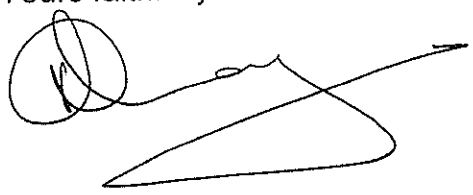
4. There are no water requirements for operation.

5. If any Aboriginal artefacts or sites are located during excavation the W.A. Museum will be notified.

6. The proposal is to return the site to the natural vegetation which surrounds the site. This will be achieved by returning the overburden and topsoil back over the site, deep ripping and spreading of the seeds from natural vegetation over the area.

7. Diagram 3 covers questions 7 & 8 showing staged rehabilitation with minimum exposure of working area.

Yours faithfully



Noel David Murray
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Esperance Shire Council
PO Box 507
ESPERANCE WA 6450

4th December 1999

Attention: Barry Sponberge

Dear Barry,

RE: ANSWERS TO ISSUES RAISED BY THE DEPARTNMENT OF ENVIRONMENTAL PROTECTION

1. The proposal would include the clearing approximately 14 hectares of natural vegetation. A notice of intent has been prepared for submission week ending Friday 10th December 1999. It is hoped that the Commissioner for Soil and Land Conservation will see fit to allow the clearing to be done in stages as required (and not the mandatory 2 years from approval time limit).

2. Have had a meeting with Lez Coyne (Wildlife Officer of CALM) on 22nd November 1999 regarding rare flora and forna on Locations 471, 26885 & 30672. According to CALMS current maps and available information there is no declared rare flora and forna.

   The Shire has also contacted CALM regarding same issue Klause Tiderman from CALM is going to inspect the site for them.

3. The proposed set back from the boundaries from reserve 30672 is 50m as shown in Figure 1 of original extraction licence application. There is also a gazetted road reserve which follows southern boundary to Lake Quallilup.

   3.1 The distance between proposed area and reserve 26885 is approximately 750 metres.

4. Rehabilitation would begin as the operation moves along the hill. This would involve pushing over burden and cap rock back on site and seeding of natural vegetation (Acacia Cyclops, Leucopagon Parviflorus, Pultengea Obeordata, Callitris and Spyridium Globulosum).

5. It is hoped 5,000 tonnes per annum will be required. Screening of product would be required in the initial stages with crushing required at a latter date. I will be having discussions with Andrew Mack regarding registration.

Yours faithfully

Noel David Murray
DIRECTOR TRIPLE M TRANSPORT (WA) Pty Ltd

ATTACHMENT 4

STATE OF THE ENVIRONMENT REPORT Western Australia 2007 Chapter 3 LAND

Key findings

- About two-thirds of South West agricultural soil is at risk of acidification.
- Between 1990 and 2004, use of lime and dolomite as a soil treatment increased nearly 900%.
- Farmers are using about half of the lime required to maintain current acidity levels in South West soils.
- Subsurface acidification is now recognised as a serious and growing problem.

3.3 Soil acidification

Description

Many soil types are naturally acidic. Problems arise when acidity increases and affects plant growth. Soil acidification occurs due to a gradual increase in the hydrogen ion content of the soil, and is measured by a decrease on the 'pH' scale. This scale varies from pH 0 (strongly acidic) to pH 14 (strong base), with pH 7 being neutral. The most widespread cause of soil acidification is from agriculture practices including application of nitrogenous fertilisers, the leaching of nitrate from legume crops and pastures, and the gradual removal of alkalinity (material that buffers against soil acidity) from soil into harvested or grazed plants. Unfortunately, these are side-effects of agricultural production. Acidification can also be caused by the oxidation of sulfide soil minerals during mining or land development, acid deposition from industrial atmospheric pollutants (e.g. sulfur dioxide) or land contamination.

Soil acidification is difficult to identify, particularly when it occurs below the soil surface. A decline in vegetative condition or agricultural productivity is often the first sign. The critical point for this decline is generally accepted to be about pH 4.5, but this varies among plant and crop species. Soil acidification is primarily managed through lime application, either as lime sand or crushed limestone. Dolomite is also used in some areas. Other practices such as reduced nitrogen fertiliser input, the use of nitrate-based fertilisers, improved timing of fertiliser application with regard to plant growth, and efficient irrigation practices can also be adopted to help reduce acidification. Over time, unchecked acidification can result in nutrient deficient soils and the accumulation of toxic materials, such as aluminium and manganese, which inhibits plant root growth and reduces crop yields. Unmanaged, it may also cause subsurface soil acidification (10-30 cm below the soil surface) which is much more difficult to treat.

Objectives

- To prevent the development of critical levels of soil acidification (pH < 4.5) in agricultural systems and return acidified soils to pH levels suitable for agricultural production.
- To minimise and prevent, where possible, formation of acid soils.

Condition

Indicator L8: Area of land with soils at risk of acidification.

Most farmers have a general awareness of soil acidity and knowledge of how to treat acidity problems. While no broadscale

monitoring exists, regional modelling for the South West is available to determine areas at risk of surface and subsurface acidification. Most of the South West shows evidence of elevated surface soil acidity risk, although some soils are more susceptible than others (Figure L3.1). It is estimated about two-thirds of the agricultural Wheatbelt is affected by surface soil (topsoil) acidity, or is at risk of acidification. The estimated area of strongly acidic soils (pH < 4.8) is 1-8 million hectares, and of moderately acidic soils (pH 4.8-5.5) is an additional 7-19 million hectares (Commonwealth of Australia, 2001b). This area is much greater than the land affected by dryland salinisation (see '*Land salinisation*').

Subsurface soil acidity can have as much effect on plant growth as surface acidity, but is more difficult and costly to treat, and in the long term may be more problematic and threatening. It is estimated there are 0.2-4.8 million hectares of acid subsurface soils in Western Australia (Commonwealth of Australia, 2001b). The areas with, or at highest risk of, subsurface acidification include the northern Wheatbelt and soils from Perth to Geraldton and Augusta to Albany (Figure L3.2). Estimates for the Avon River Basin, indicate that about 93% of surface soils and 83% of subsurface soils have moderate to high risk of acidification (Department of Agriculture and Food, unpublished).

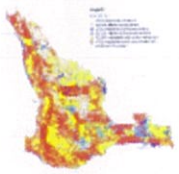


Figure L3.1: Modelled surface soil acidification risk for the South West.

Data source: Department of Agriculture [ver. 2005]; Presentation: Department of Agriculture.

Figure L3.2: Modelled subsurface soil acidification risk for the South West.

Data source: Department of Agriculture [ver. 2005]; Presentation: Department of Agriculture.

Pressures

Indicator L9: Area of land planted for cropping, including legumes and wheat crops.

Plants take up nutrients (including acid-buffering chemicals) from soil, resulting in a separation of acidity in the soil and alkalinity in the plant. As agriculture removes plants from land (by harvesting crops or grazing pasture) less alkalinity is returned to the soil and over time it becomes progressively acidic. In the 10 years from 1994-2004, the total area of land dedicated to cropping has increased by about one-third, from 6.1 to 8.1 million hectares (Commonwealth of Australia, 2001b; Australian Bureau of Statistics, 2005). More land dedicated to cropping puts a greater area of land at risk of soil acidification.

Grasses, legumes and wheat typically acidify the soil faster than pasture due to their inefficient use of nitrate. In contrast, annual and perennial pastures are able to establish earlier at the break of the season (when rain starts) and effectively utilise the nitrate thereby reducing the rate of acidification. The area under legume production has decreased by nearly 40% between 1999 and 2005. This may help to alleviate high rates of soil acidification in some areas. The area under wheat production is about 13% higher and has increased in recent years due to favourable growing conditions (Table L3.1).

Table L3.1: Area of Western Australian land under legume and wheat production, 1999-2005.

Year ending (June)	1999	2000	2001	2002	2003	2004	2005
Area of legume crop ('000 hectares)	1229	1166	1077	990	886	732	776
Area of wheat crop ('000 hectares)	4511	4556	4460	4340	4458	4917	5118

Data source: Australian Bureau of Statistics - Agricultural Commodities Australia reports.

Indicator L10: Annual amount of nitrogenous fertiliser applied per hectare in agricultural areas.

Fertiliser containing nitrogen is primarily used for enhancing grain and pasture production. Dependency on fertiliser in WA is rising. Between 1989-90 and 2001-02, the amount of nitrogen-based fertiliser applied to soil grew about 450%, from 88 000 tonnes to 399 000 tonnes (McLennan, 1996; Australian Bureau of Statistics, 2002). When these fertilisers leach into soil, 'nitrification' (the natural process of conversion of ammonium to nitrate) occurs, during which acid is produced. If growing plants take up nitrate the potential for acidification is reduced, but if nitrate is leached from the root zone then acidity can build up. All ammonium-based fertilisers cause acidification, whether leached or not. Fertilisers that are not ammonium-based (such as urea) only cause soil acidification if the nitrate, into which they are converted, leaches from the root zone. Superphosphate fertilisers are not directly acidifying, but indirectly add to soil acidity by improving plant growth, and hence the amount of plant material (containing acid buffering chemicals) removed by harvesting or animal grazing. Application of sulfur to soil is also acidifying.

Current responses

Indicator L11: Annual amount of lime applied per hectare in agricultural areas.

Soil acidification in agricultural areas is primarily managed through lime or dolomite application. Best practice guidelines indicate that lime should be applied at one to 1.5 tonnes per hectare every 3-7 years. If soil pH is below 4.5, then two applications of lime are required within 5 years to lift the pH to within the normal range, which is then maintained by a liming maintenance regime. The best agricultural production responses to lime have occurred when the topsoil pH is very low (i.e. pH < 4.5). Moderately acidic soils (pH 5-5.5) typically show little yield response but depending on the crop, season and yield potential this may not always be the case.

In 2004, the amount of lime and dolomite applied to agricultural soils affected by acidity was 1.03 million tonnes - the highest level of use yet recorded in WA (Figure L3.3). There is evidence of a gradual rise over the past decade in both the area of farmland treated and the quantity of lime being used. While growth in lime use is encouraging from an agricultural perspective, the actual amount of lime required to maintain current acidity in agricultural soils is about double (2 million tonnes per year). Unfortunately, monitoring of lime use has since ceased and was not undertaken in 2005 and 2006.

Treatment of subsurface soil acidity with surface applications of lime can take many years. Subsurface soil acidification under crops has the potential to severely limit crop and pasture production. For long-term soil health, the prevention or minimisation of subsurface soil acidity is vital.

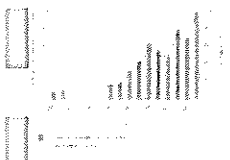


Figure L3.3: Western Australian lime and dolomite use and area treated over time.

Data source: Australian Bureau of Statistics, 1996 & 2002; O'Connell & Gazey, 2003; C Gazey, Department of Agriculture and Food, pers. comm.

Indicator L12: Percentage of farmers undertaking soil pH testing.

Estimates of surface soil testing for pH vary from 30% of farmers testing portions of their farms (Nutrient Management Systems, pers. comm.) to 65-75% of farmers undertaking regular pH testing of surface soils (Department of Agriculture, 2006). It is estimated that only 10% of farmers test acidity levels of subsurface soils (C Gazey, Department of Agriculture and Food, pers. comm.). Surveys also show that farmers have developed an increased awareness of acidification problems and the skills to help correct the problem (Department of Agriculture, 2006).

Draft State Lime Supply Strategy: was initiated in 1998 with the intention of enabling informed decisions about lime production and supply in relation to environmental, conservation, urban and heritage issues. The Department of Industry and Resources oversaw development of the strategy, with guidance from other government agencies (Department of Industry and Resources, 2001). The strategy is currently in draft form and is considered to be an evolving document.

Natural Heritage Trust/National Action Plan for Salinity and Water Quality (NHT/NAP): Through these two Commonwealth Government programs, the South West, Swan, Avon, Northern Agricultural and South Coast regional natural resource management groups have recognised soil acidification as a threat to natural resources. Strategies have outlined specific targets and onground projects to address soil acidification.

Integrated Soil Acidity Research, Development and Extension Program, 1992-2002: The Department of Agriculture and Food in conjunction with University of Western Australia, the Grains Research Development Corporation, and the Natural Heritage Trust coordinated this program. It investigated methods for slowing the rate of soil acidification, establishing the relationship between the level of subsurface acidity and crop yield losses, and developed techniques to add alkalinity back to acidifying soils. It was supported by a promotional extension campaign 'Time to Lime', during which annual lime use by farmers increased by 530% from 150 000 tonnes in 1994 to more than 800 000 tonnes in 2002 (Figure L3.2). The number of farmers using lime rose by 240% from 1353 to 3292 over the same period (Department of Agriculture, 2003).

Implications

Across Australia, the economic implication of soil acidification is estimated to be five to six times higher than dryland salinity (Commonwealth of Australia, 2001b). Acidity is insidious, with yield declines of 20-30% occurring over time (Department of Agriculture, 2000). Such losses may go unnoticed if farm productivity is improving for other reasons, such as increased fertiliser use. Plant and crop growth is often limited because of a reduction in the availability of nutrients (calcium, magnesium, boron, molybdenum) or an increase in toxic levels of aluminium, iron or manganese. Toxic levels of aluminium decreases root growth which leads to reduced water uptake by plants and crops, hence contributing to other problems such as waterlogging, erosion and salinisation. Extreme acidification can result in poorly structured or hard-setting topsoils that don't support enough vegetation to prevent soil erosion. Soils may also acidify to the point where acid, nutrients, sediment and heavy metals are exported and impact nearby inland waters (see '*Acidification of inland waters*').

Liming is viewed as the major remediation option for soil acidification on farms. Risks of substantial farm losses exist if liming programs are not commenced before critical surface and subsurface pH levels are reached. However, due to the rapid increase in lime use in agricultural, mining and construction industries, significant pressure has been placed on existing and potential limestone stocks. Lime is currently quarried at about 30 coastal sites between Geraldton and Esperance, with many situated in areas of conservation value. These sites are under significant threat from increased lime mining activity as demand increases, and questions are being raised about the sustainability of liming.

Suggested responses

3.7 Develop and implement a Soil Acidification Management Strategy as a component of the proposed State Soil Protection Policy, covering all types of acid soils.

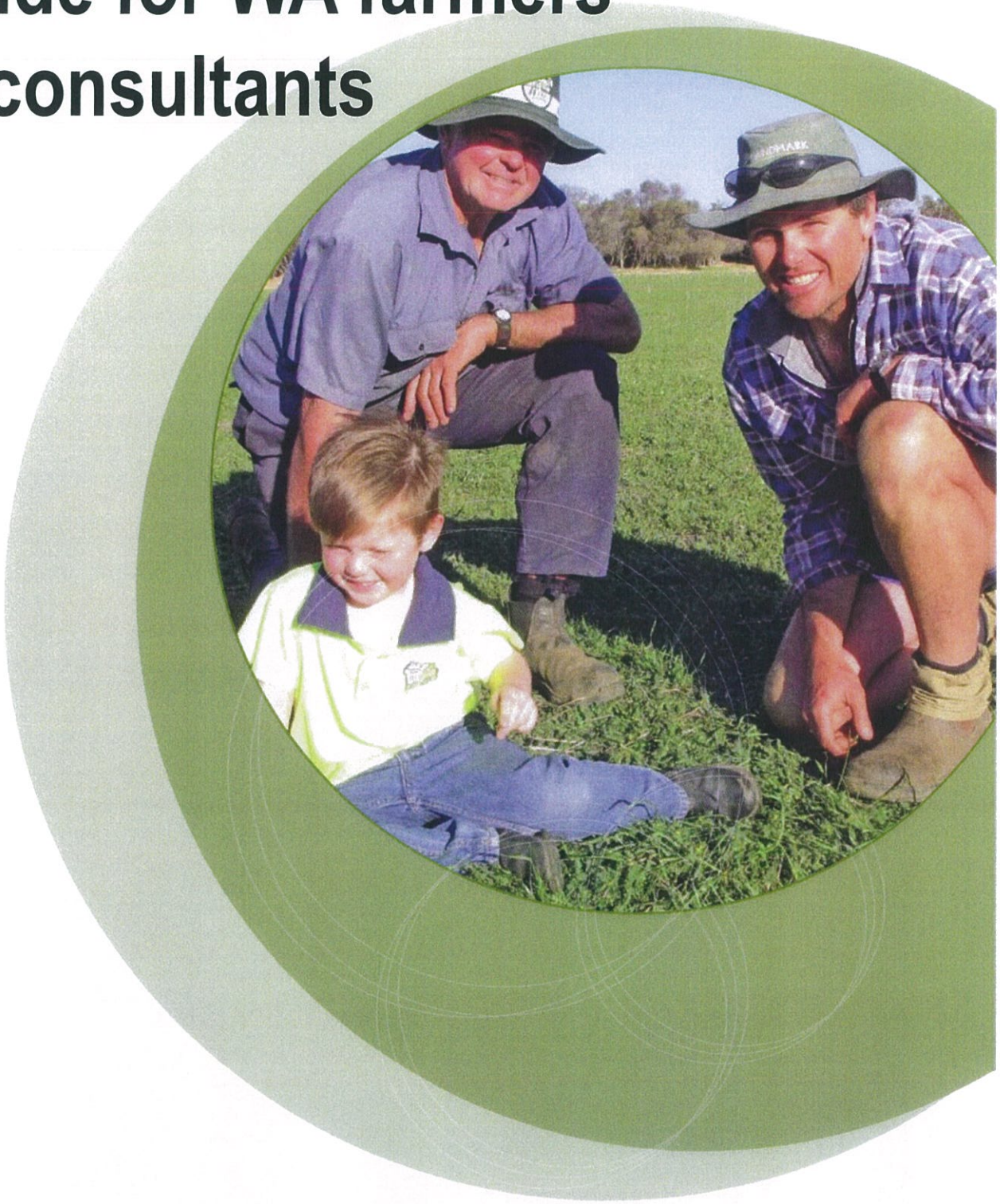
3.8 Finalise and implement the draft State Lime Supply Strategy incorporating sustainability principles.

GOVERNMENT OF WESTERN AUSTRALIA
Department of Agriculture and Food

Bulletin 4784
ISSN: 1833-7236

Soil acidity

A guide for WA farmers and consultants



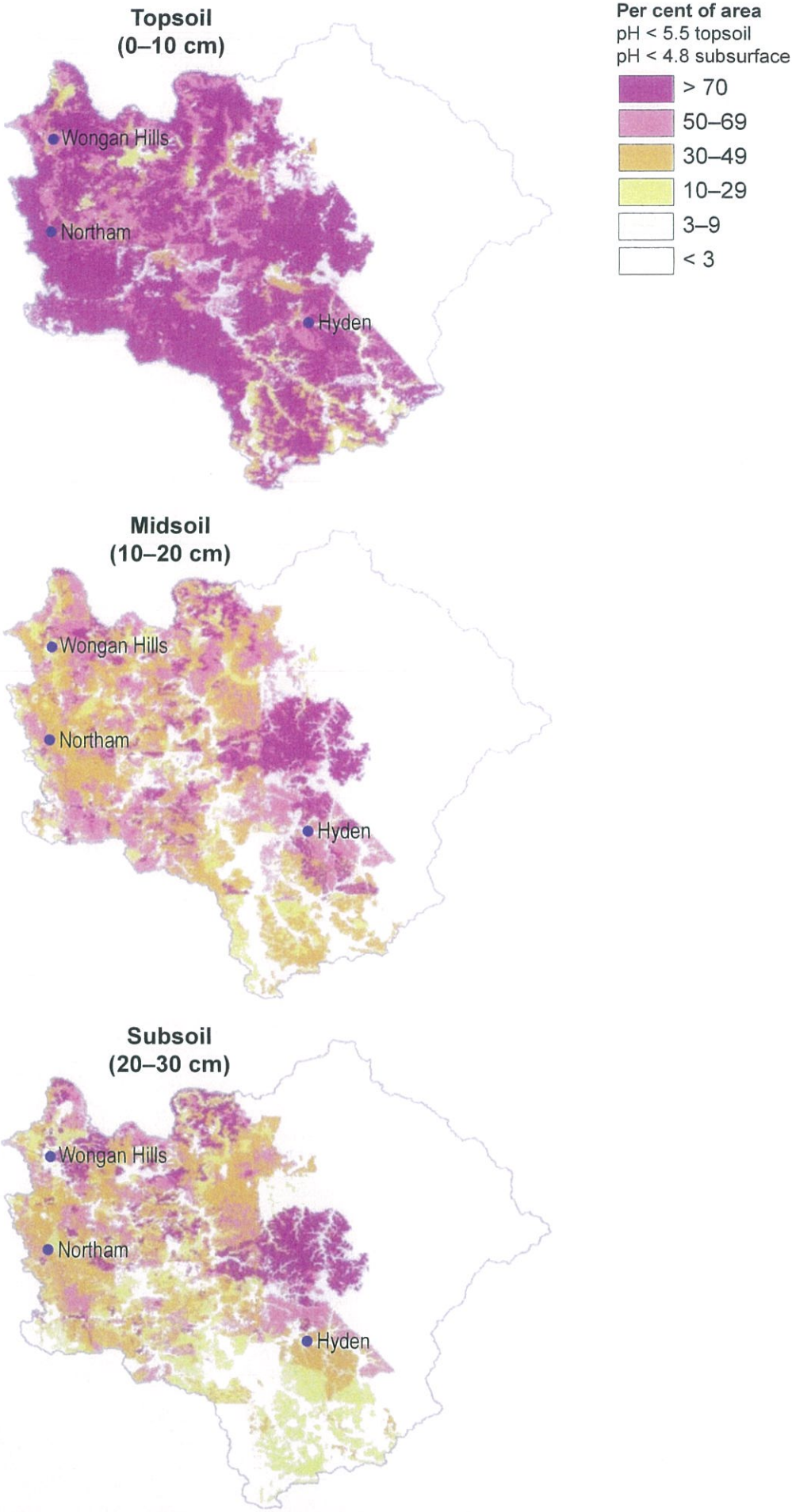
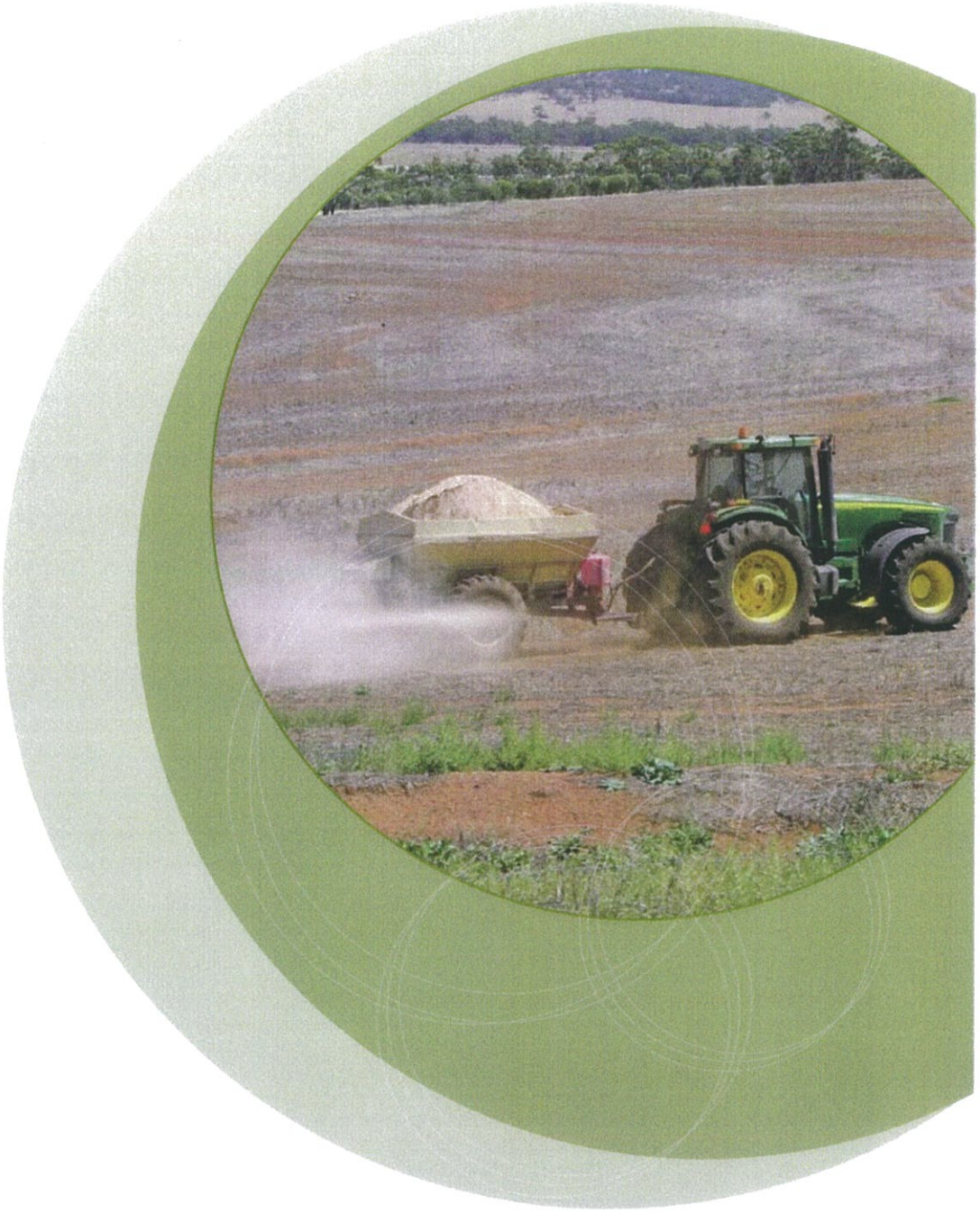


Figure 2 **Percentage area of the Avon River Basin (Figure 1) with soils below DAFWA pH targets**

PART 1

Management of soil acidity



Diagnosing soil acidity

The only way to diagnose soil acidity is to sample the soil and test the pH. While liming to counter soil acidity needs to be part of normal farming practice in most of the wheatbelt, accurate knowledge of the soil pH allows more precise management decisions. Subsurface soil testing to determine the pH profile of the soil is vital. In many soils, an acidic subsurface or acidic subsurface layer may be limiting root growth and access to water and nutrients (Figure 3).

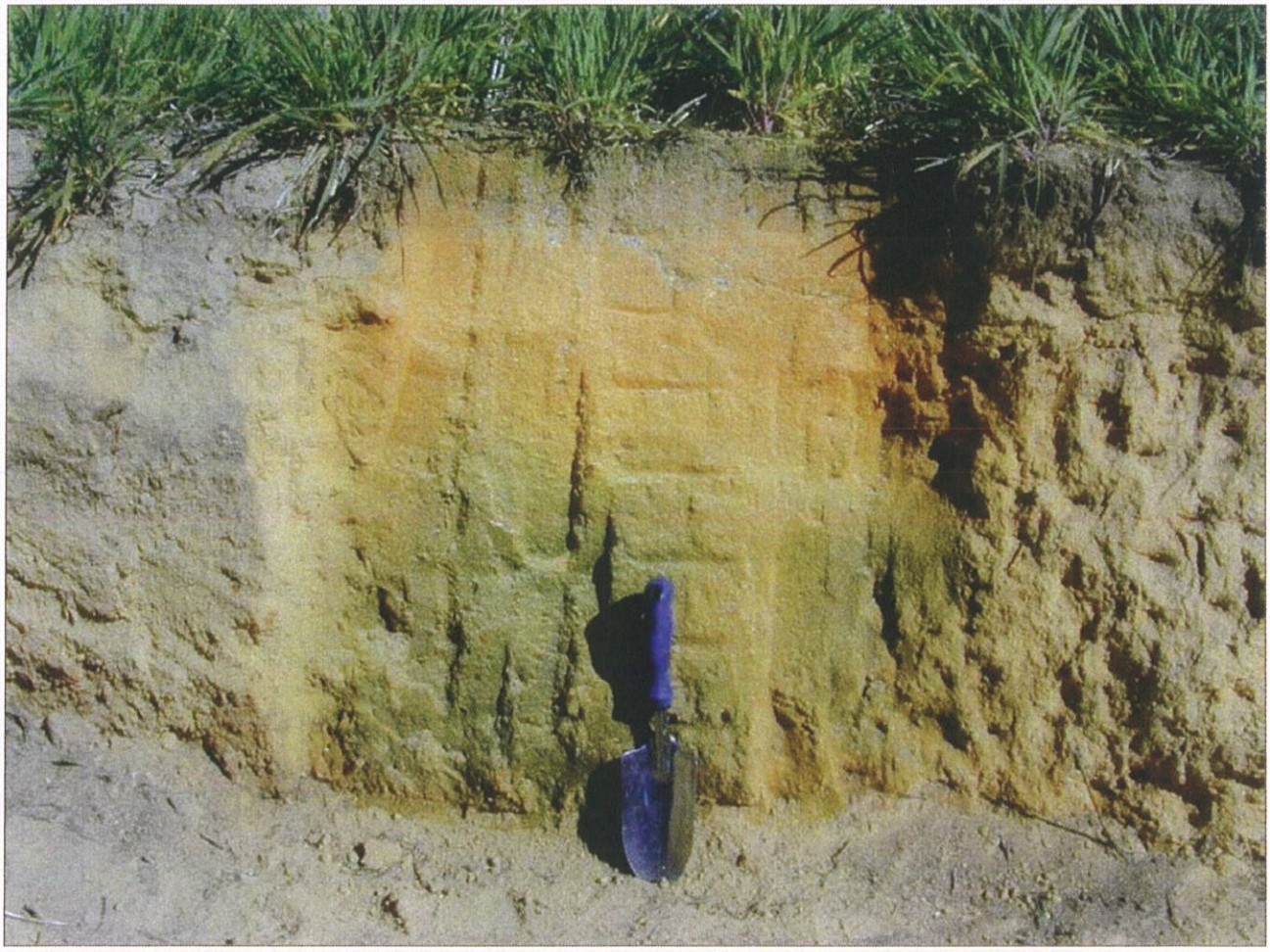


Figure 3 **Soil profile at Tammin stained with universal indicator showing acidic subsurface layer (stained orange) which prevents root access to soil with suitable pH below (stained green)**

Soil sampling

Topsoil pH can be quite different from the subsurface soil pH and sampling only the topsoil may lead to inadequate lime applications. Acidity in the subsurface cannot be detected or estimated by knowing the topsoil pH. Samples should be taken at 0–10, 10–20 and 20–30 cm to determine a soil pH profile.

Ideally, soil samples should be taken in summer, when most soils are hot and dry with minimal biological activity. This will minimise the impact of seasonal variations in pH, which will be further reduced by measuring pH in a calcium chloride solution rather than water.

Paddock variability, particularly soil type changes, should be taken into account when designing sampling programs. It is important not to under-sample; knowing and understanding 'management areas' within paddocks will allow targeted lime inputs to maximise economic return. For example, clay soils are generally slower to acidify but require more lime to lift pH when they become acidic.

Diagnosing soil acidity

Commercial contractors

The best option is to use a specialised soil-sampling contractor and seek expert advice for individual liming recommendations (Figure 4). Professional soil-sampling contractors should geo-locate sampling sites and arrange laboratory testing of the samples. They may also provide record-keeping services and liming recommendations. Sampling for soil pH testing is often done in conjunction with soil nutrient sampling for fertiliser recommendations.

Do-it-yourself sampling

A do-it-yourself approach to soil sampling is possible. Divide the paddock up according to soil type and areas that have different crop or pasture growth. Typically, six to eight sample sites per paddock is adequate, with representative sites from each soil type or management area in the paddock. If the paddock is uniform, a grid pattern can be used or evenly space sites over the whole paddock. Avoid unrepresentative areas such as stock camps, paddock corners and harvest windrows.

Collect cores from around each site and bulk them into one sample, keeping the 0–10, 10–20 and 20–30 cm layers separate and being careful to prevent topsoil contamination of the subsurface samples.

Traditionally, soil sampling has been done with a 'pogo stick' sampler, designed to sample the top 10 cm of soil. This type of sampler is unsuitable to sample the 10–20 and 20–30 cm soil layers that are necessary for soil pH sampling. A 5 cm diameter exhaust tube, marked in 10 cm increments, is a suitable alternative (Figure 5).

Soil samples should be sent to a laboratory accredited with the Australasian Soil and Plant Analysis Council Inc. and the pH measured in a one part soil to five parts 0.01 M calcium chloride solution (see measurement of pH, page 25).

Do-it-yourself soil sampling has a number of drawbacks; it requires a dedication to the task and inputs of time for sampling, arranging laboratory testing, sourcing liming

Figure 4 **Soil sampling at Kellerberrin. Professional soil-sampling contractors should be able to accurately sample the soil profile.**

recommendations and accurate record keeping to enable comparable repeat sampling over years for monitoring pH change.

Commercial soil sampling kits

Prepaid commercial soil sampling kits are available and may be the most convenient method for the do-it-yourself approach as they include full instructions, sample bags, postage and laboratory testing of the samples. These kits are primarily aimed at topsoil sampling and testing for fertiliser recommendations, but the subsurface 10–20 and 20–30 cm layers may be sampled for pH at the same time (a suitable sampling tube, or commercial soil sampling contractor able to accurately sample the subsurface, will need to be used).

Field pH testing

Laboratory testing of pH provides the most accurate measurement of soil pH. Field testing with a hand-held pH probe may provide an indication of areas that need accurate soil sampling and testing. Hand-held pH probes are available from scientific equipment suppliers and come with instructions. When field testing soil pH, it is usually more convenient to use deionised or distilled water instead of 0.01 M calcium chloride and so the results will need to be converted by subtracting 0.7. It is important to maintain the probe in good condition and calibrate with standard pH buffer solutions each day it is used.

Soil pH test kits that use indicator solutions and colour to estimate pH are inexpensive and easy to use. However the results are subjective and should be used with caution. The chemicals used with the kits are subject to deterioration.

Monitoring soil pH

Monitoring soil pH by re-sampling every three to four years enables liming programs to be developed and refined for individual situations. Tracking changes in the soil pH requires samples to be collected from the same location over time. Samples need to be properly geo-located, preferably by GPS, to allow comparable repeat sampling.

Sampling 25 per cent of a farm each year enables a four-year rotation. This is an adequate time frame to detect changes and allow adjustment of liming practices.

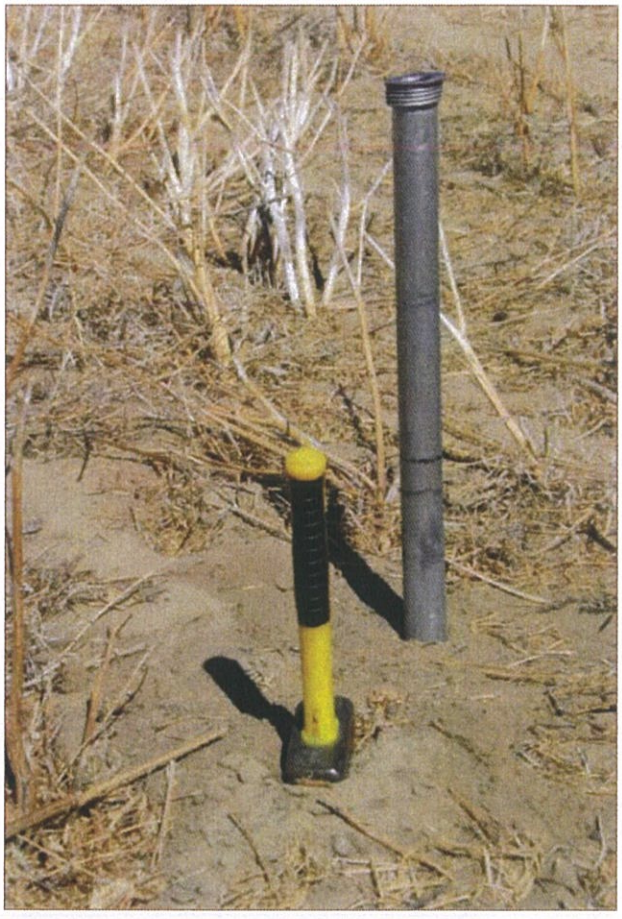


Figure 5 **An exhaust tube marked in 10 cm increments is useful for do-it-yourself sampling.**

Liming acidic soils

Soil acidification is an inevitable and ongoing consequence of productive agriculture. Whether soil becomes acidic depends on how well ongoing soil acidification is managed as part of the farming system.

Target pH

DAFWA recommends soil pH values at or above 5.5 in the topsoil and 4.8 in the subsurface (Figure 6). These values have been developed based on hundreds of trial-years of data. Maintaining topsoil pH above 5.5 will treat ongoing acidification and ensure that sufficient alkalinity can move down the soil profile and treat subsurface acidification. The effects of aluminium toxicity in the subsurface are minimised if the pH is above 4.8.

Soil pH test results can be interpreted using DAFWA targets as a basis. If the top and subsurface soil pH values are at or above target values, only maintenance levels of liming will be required to counter ongoing acidification due to agriculture.

If the topsoil pH is below 5.5, recovery liming is recommended to prevent the development of subsurface acidity, even if the subsurface pH is currently at 4.8. When the topsoil pH is below 5.5, insufficient alkalinity can move down to counter ongoing acidification in the subsurface and the pH is likely to drop. If the subsurface pH is below 4.8, liming to maintain (or recover) topsoil pH at or above 5.5 is essential and subsurface pH should be monitored in three to four years so that the liming rates can be adjusted if insufficient alkalinity has moved down to treat the subsurface acidity.

Figure 6 **Discussing the implications of a target pH profile at Casuarina, north of Mingenew**

Liming acidic soils

Applying agricultural lime is the most cost-effective way of treating soil acidity. The amount of lime required will depend on the current pH profile, soil type, rainfall, farming system and lime quality.

Maintenance liming

Knowing how farming system inputs and exports contribute to soil acidification will help to calculate the amount of lime required to counter ongoing soil acidification due to agriculture (maintenance liming).

Different amounts of alkalinity are exported in various farm products and need to be replaced in the form of lime to prevent soils acidifying (Table 1).

The amounts of lime required to counter the acidifying effects of common nitrogen fertilisers are given in Table 2. Ammonium fertilisers are the most acidifying. Elemental sulfur can contribute to soil acidification when it is converted to sulfate (the form that can be taken up by plants), however, relatively little elemental sulfur is applied in WA farming systems and its contribution is small compared to ammonium fertilisers. If sulfur is applied in the form of sulfate, as in calcium sulfate (gypsum) it is non-acidifying. Phosphate fertilisers are non-acidifying.

Typically, a wheatbelt farming system operating a winter crop/pasture rotation in WA has an acidification rate equivalent to 25–345 kg/ha/year of pure calcium carbonate (Dolling 2001). Required liming rates can only be estimated and monitoring of the soil pH profile every three to four years is recommended so that the liming program can be refined.

Table 1 **The lime equivalent (as pure calcium carbonate) of various farm products (Moore 1998)**

Product removed	$CaCO_3$ equivalent (kg/t)
Cereal grains: wheat	9
barley	8
triticale	7
Cereal whole tops	20
Canola	2
Lupin grain	20
Lupin whole tops	60
Lucerne hay	60
Hay (mixed grasses)	30
Subclover (whole plant)	40
Sheep: dung	25
urine	9
lambs	3
wool (6 kg/sheep)	0.4

Table 2 **Lime (as pure calcium carbonate) required to neutralise acidity generated by various common nitrogen fertilisers (Moore 1998)**

Nitrogen fertiliser	$CaCO_3$ required to neutralise nitrogen addition (kg $CaCO_3$/kg nitrogen[1])	
	none leached	100% leached
Ammonium sulfate (Agras #1, MAP)	3.6	7.1
Ammonium nitrate (Agran)	0	3.6
Urea	0	3.6
DAP	1.8	5.4
Potassium nitrate	–3.6[2]	0
Sodium nitrate	–3.6	0

[1] Per weight of nitrogen (N) in the fertiliser, not per weight of the fertiliser.

[2] Negative values indicate a liming effect by the fertiliser.

Recovery liming

Estimating the amount of lime required to recover acidic soil to recommended pH targets is complicated. Enough lime needs to be applied to treat ongoing acidification as well as the already acidified soil (Figure 7).

The rule-of-thumb guide (Table 3) indicates of the amount of lime that may be required to achieve topsoil pH above 5.5 and subsurface pH above 4.8 after 10 years. Increases in pH will depend on soil type, rainfall, lime quality and quantity applied and other farming practices as well as the soil pH profile. Expert advice should be sought for individual recommendations.

Monitoring the topsoil and subsurface soil about every three years is very important when liming to recover acidic subsurface soil. This will allow adjustment of the liming schedule as the soil pH increases or if it does not respond as expected. It is essential to maintain the topsoil pH above 5.5 for alkalinity to move down to treat acidity in the subsurface soil.

Table 3 **Rule-of-thumb lime guide developed for the Avon Catchment Council**

Soil depth (cm)	pH	Lime amount over 5 years
0–10	< 5	2 t/ha
	< 5.5	1 t/ha
		plus
10–20	< 4.5	2 t/ha
	< 4.8	1 t/ha
		plus
20–30	< 4.5	1 t/ha
	< 4.8	measure pH in 3 years

Figure 7 **Liming trial at South Bodallin. When enough lime is applied to treat an acidic soil profile significant plant growth and production responses can be achieved.**

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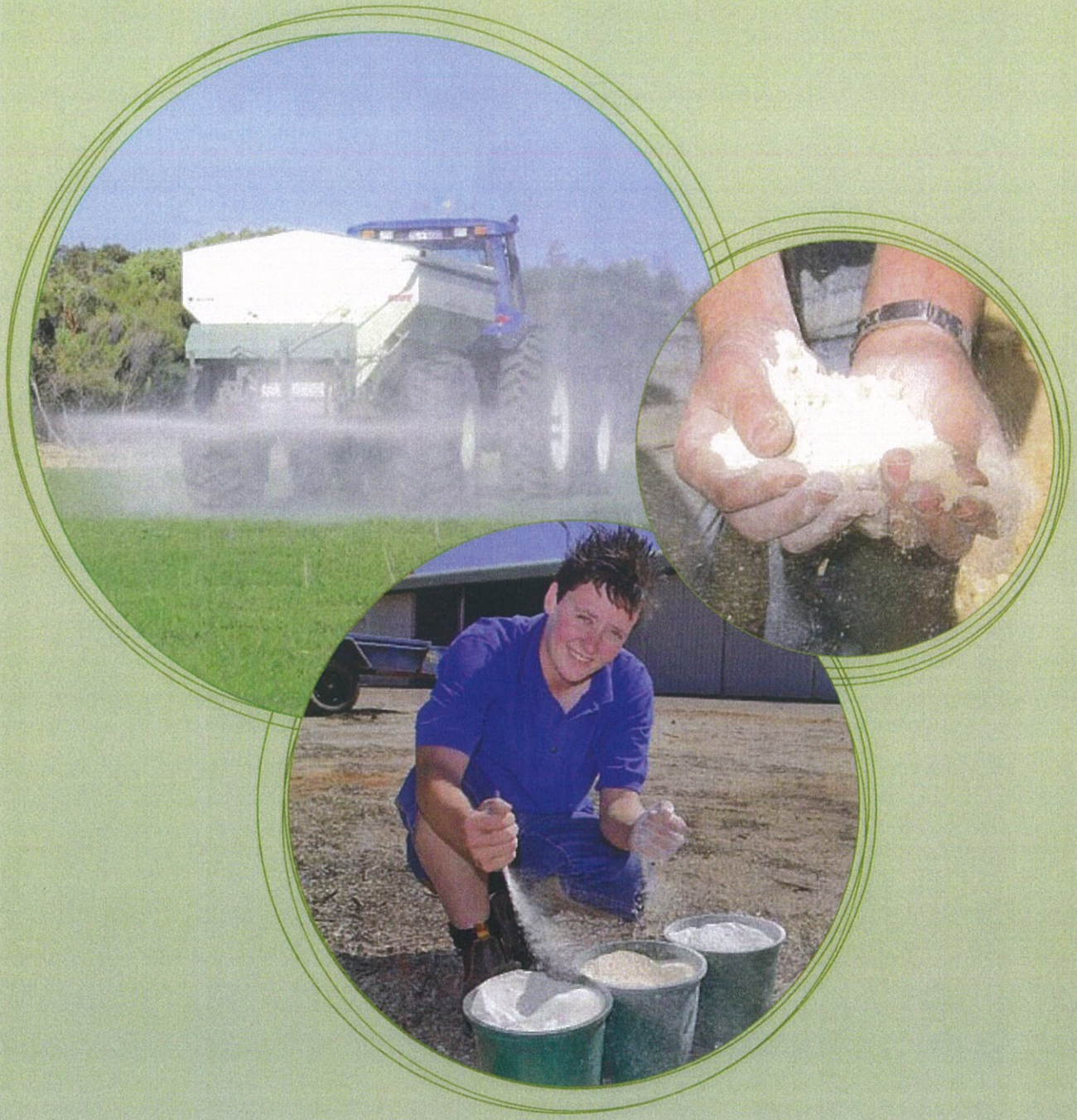
Survey of Western Australian agricultural lime sources



Results

A total of 37 agricultural lime pits were sampled over three weeks during April and May 2008, with one pit no longer operating and data not presented. A further six pits were contacted but either did not give approval to sample or did not return calls. In the main, suppliers were supportive of the project and its intent.

Many suppliers were aware of the importance of particle size and had modified their processes to get a higher proportion of fine particles. They were aware of needing to monitor their crushing plant performance.

The map shows the locations of all pits sampled, labelled with the sample identification; the corresponding pit names are shown in Table 1.

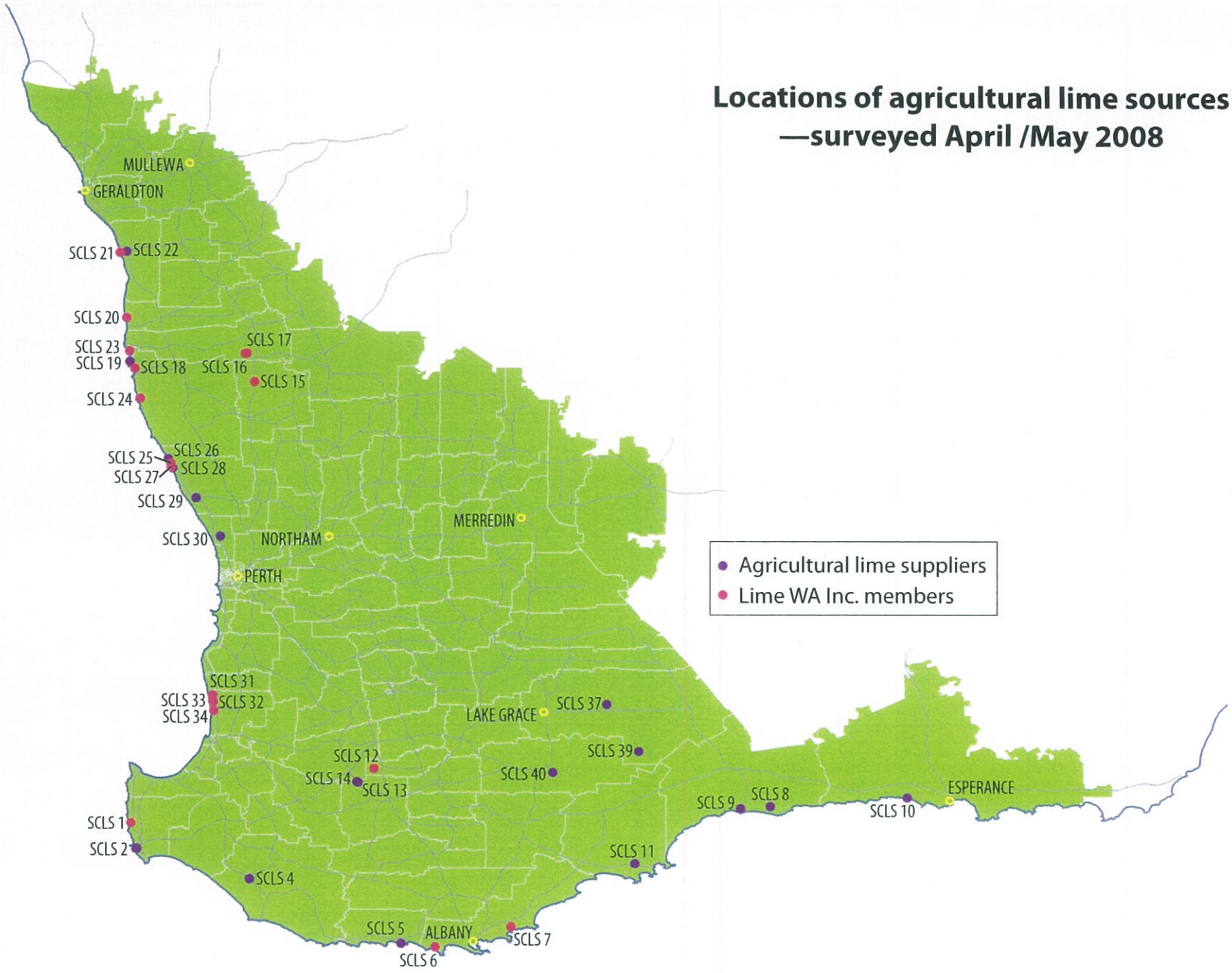
Table 1. *Agricultural lime pits sampled as part of the survey.*

Sample ID	Pit	Product	Location
SCLS1	Redgate Lime	Limestone	Witchcliffe
SCLS2	Doust Enterprises	Limesand	Karridale
SCLS4	WALCO Windy Harbour	Limestone	Windy Harbour
SCLS5	Ocean Beach Lime	Limesand	Denmark
SCLS6	Bornholm Ag Lime	Limesand	Bornholm
SCLS7	WALCO Manypeaks	Chalk lime	Manypeaks
SCLS8	Mason Bay Lime	Limestone	Hopetoun
SCLS9	Krystal Park Estate	Limestone	Hopetoun
SCLS10	Triple M Transport	Limesand	Esperance
SCLS11	Bremer Industrial Services	Limestone	Bremer Bay
SCLS12	Beaufort River Dolomite	Dolomite	Beaufort River
SCLS13	Kojonup Dolomite	Dolomite	Kojonup
SCLS14	Marononi Dolomite	Dolomite	Kojonup
SCLS15	Watheroo Dolomite	Dolomite	Watheroo
SCLS16	Watheroo Minerals W	Dolomite	Watheroo
SCLS17	Watheroo Minerals Y	Dolomite	Watheroo
SCLS18	Aglime Jurien	Limesand	Jurien Bay
SCLS19	Jurien Lime Sands	Limesand	Jurien Bay
SCLS20	Yarra Sands	Limesand	Coolimba
SCLS21	Aglime Dongara	Limesand	Dongara
SCLS22	Irwin Lime Sands	Limesand	Dongara
SCLS23	Greenhead Sands	Limesand	Green Head
SCLS24	Aglime Cervantes	Limesand	Cervantes
SCLS25	Aglime Lancelin	Limesand	Lancelin
SCLS26	Dala Pit	Limesand	Lancelin
SCLS27	Rules Limesand	Limesand	Lancelin
SCLS28	Optima Lancelin	Limesand	Lancelin
SCLS29	Optima Gingin	Limestone	Guilderton
SCLS30	JJ Hawkins	Limestone	Wanneroo
SCLS31	Doyle's Lime Service	Limestone	Myalup
SCLS32	Lake Preston Lime	Limestone	Myalup
SCLS33	Versaci Lime	Limestone	Myalup
SCLS34	Carbone Bros	Limestone	Myalup
SCLS37	Newdegate Dolomite	Dolomite	Magenta
SCLS39	Greens Dolomite	Dolomite	Magenta
SCLS40	Pingrup Dolomite	Dolomite	Pingrup

Survey details and analytical results as supplied by the Chemistry Centre of WA are presented in Appendix A.

There was a large range of neutralising values (Table 2) for the agricultural lime available to WA agriculture. In general, the limesand products had a higher proportion of particles below 0.5 mm, and higher neutralising values.

Locations of agricultural lime sources —surveyed April /May 2008



TRIPLE M TRANSPORT

Pit details:

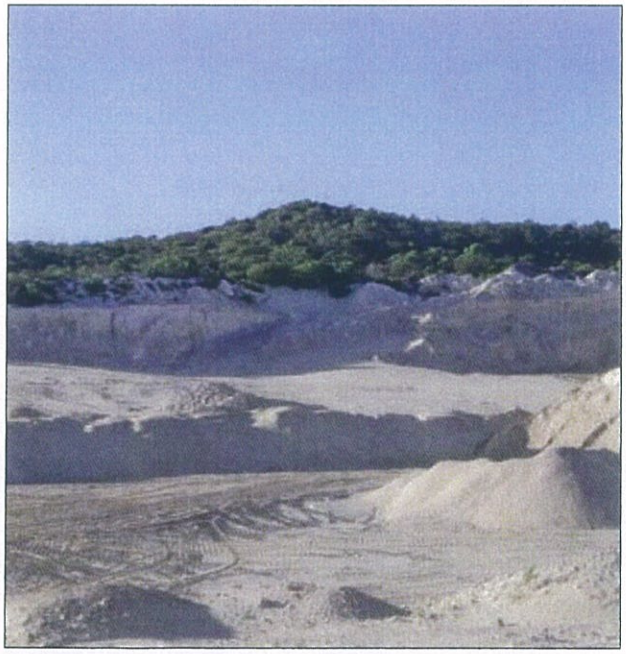
Pit location:	**Esperance**
Pit contact:	**Chip Murray**
Telephone:	**9076 1291**
Mobile:	**0428 934 627**
Fax:	**9076 1037**
Email:	**sandymurray@bigpond.com**
UHF radio:	

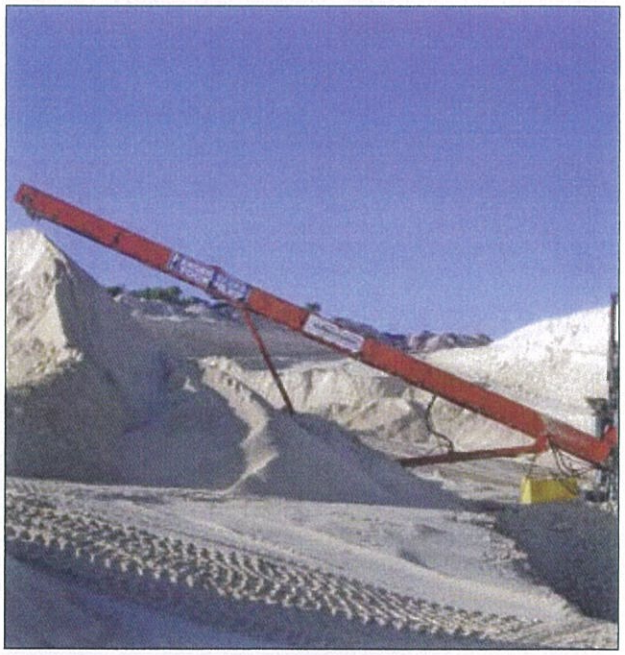
Owner details:

Owner:	**Chip Murray**
Contact:	
Address:	**PO Box 900** **Esperance WA 6450**
Telephone:	**9076 1291**
Mobile:	**0428 934 627**
Fax:	**9076 1037**
Email:	**sandymurray@bigpond.com**

Survey details:

GPS lat. & long. (TomTom®):	**-33.819990, 121.521880**	Sampled by:	**Dave Gartner**
Product:	**Limesand**	Date:	**24th April 2008**
Lime WA Inc. member?	**No**	Time:	**7.50 am**
Agree to DAFWA testing?	**Yes**	Sample ID:	**SCLS10**
Comments:			





CHEMISTRY
CENTRE

WESTERN AUSTRALIA AGRICULTURAL LIME INDUSTRY CODE OF PRACTICE

Project: **South Coast Lime Survey**
Sample Identification Mark: **SCLS10** Date Forwarded: **27-06-2008**
Chemistry Centre Laboratory No: **07A652-010** Report Date: **5-08-2008**

LABORATORY TEST REPORT

Sieve Range (mm)	% weight	Neutralising Value %
0 – 0.125	6.1	59.5
0.125 – 0.250	72.1	67.8
0.250 – 0.50	18.7	84.2
0.50 – 1.00	0.7	86.5
>1.00	2.4	78.2
Overall Result		**70.7**

Notes:
% weight = *per cent by weight of air dry sample in each fraction*
Neutralising Value = *percent of liming material expressed as calcium carbonate*

Analysis of Bulked Sample

Moisture content, as received	6.5 %
Neutralising Value	71.5 %
Calcium, soluble in 1 M HCl	25.7 %
Magnesium, soluble in 1 M HCl	1.5 %
Sodium, soluble in 1 M HCl	0.2 %

Notes:
Moisture content is determined from the weight loss upon air-drying (40 degrees)
Results for Neutralising Value, calcium, magnesium and sodium are expressed on an air dried basis

KS WALTON
Chemist and Research Officer
Natural Resources Chemistry Laboratory